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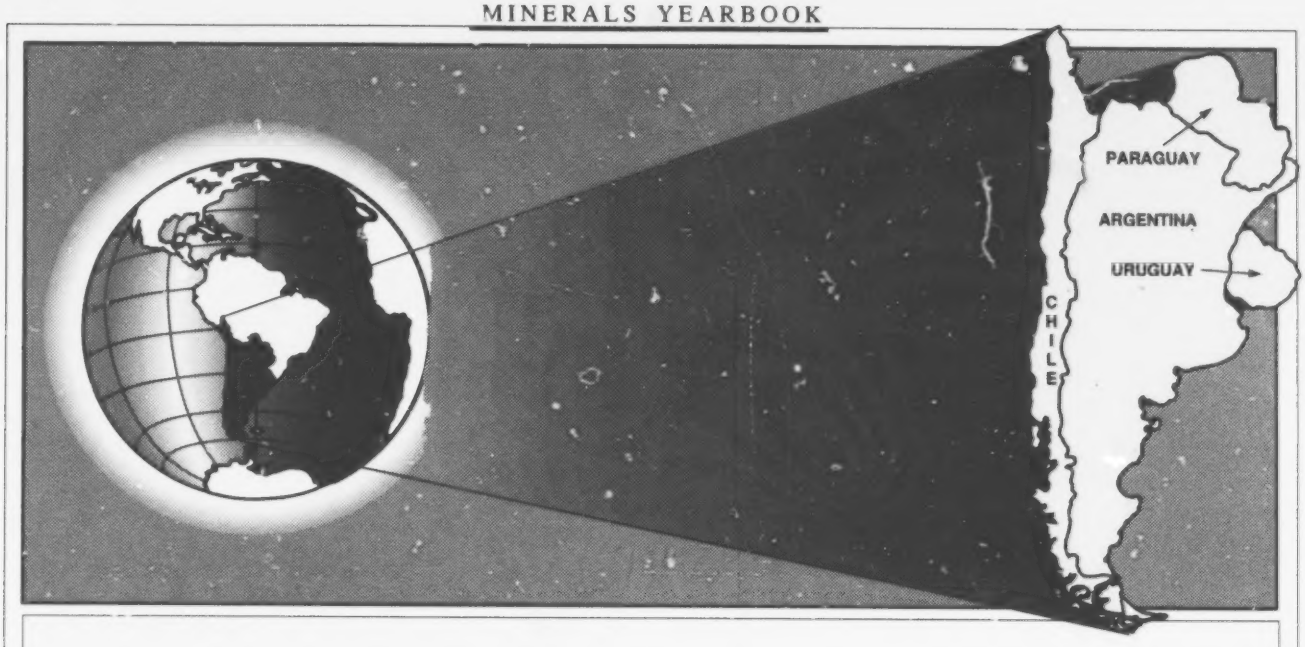

THE MINERAL INDUSTRIES OF

SOUTHERN SOUTH AMERICA

By Pablo Velasco and Alfredo C. Gurmendi

1988

INTERNATIONAL REVIEW

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

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THE MINERAL INDUSTRIES OF

SOUTHERN SOUTH AMERICA

U.S.
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Manuel Lujan, Jr.
Secretary

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Director

1988

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2THE MINERAL INDUSTRIES OF

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INTRODUCTION[1]

Argentina, Chile, Paraguay, and Uruguay make up the southern part of South America and are commonly called "southern cone" countries. As the second largest country in Latin America with a population of 32 million, Argentina's value of mineral fuels and other minerals production was at the approximate level of that of Chile, a country one-third the size of Argentina with a population of 13 million. However, Chile is a more diversified mineral producer where nonfuel mineral output is more important relative to petroleum—the mineral commodity that dominates Argentina's mineral economy.

Mineral commodities played a dominant role only in the export sector of Chile where they accounted for 61% or $4.4 billion of total merchandise exports in 1988. In Argentina, total mineral exports represented only 3% of total exports with a value of $243 million consisting primarily of crude oil and refinery products. Mineral exports are insignificant in Paraguay and Uruguay.

In terms of the world mineral economy, Chile is significant as a supplier of copper, lithium, molybdenum, rhenium, and iodine; Argentina as a supplier of borates. In 1988, Chile was the world's leading producer and exporter of copper and in second place after the United States as a supplier of molybdenum. Chile was the second largest producer of iodine after Japan.

Argentina and Chile produced a diversity of mineral fuels—crude oil, natural gas, and coal—but only Argentina was relatively self-sufficient in oil with a small surplus for export. In 1988, Argentina was a modest supplier of petroleum to the United States involving 1.3 million barrels of crude oil and 3.9 million barrels of refinery products, mostly residual fuel oil. Argentina's output of crude oil has been in a downtrend since 1981, and, by 1985, it was replaced by Brazil as the third place oil producer, after Mexico and Venezuela in the Latin American region. Paraguay exported energy to Brazil from its share of the output of the Itaipú hydroelectric complex. Argentina has entered into a number of joint hydroelectric development projects with Paraguay and Uruguay.

Argentina was the first country in the Latin American region to develop an integrated nuclear power industry involving uranium mining, milling and enrichment plants, and the installation of a 374-megawatt nuclear powerplant (Atucha I) in 1974. Argentina has also played an important role in the region as an exporter of nuclear technology to Bolivia, Brazil, Chile, Mexico, Peru, and Uruguay.

Argentina and Chile were involved with efforts to restructure their mining industries whose past development has had the strong intervention of Government. Chile demonstrated the greatest advance in its policy to privatize its mining industries and was successful in using debt-equity swaps to attract mining investment. In the near term, Chile evidenced the best prospects in the group for expanded domestic and foreign investment in the mining sector because of political stability, favorable investment climate, and good mineral potential.

The southern cone countries are all members of the Latin American Integration Association (LAIA) headquartered in Buenos Aires, Argentina, and the Latin American Energy Association (OLADE) headquartered in Quito, Ecuador. Chile is an influential member of the Intergovernmental Council of Copper Exporting Countries (CIPEC). Chile has been a proponent of the proposed International Copper Study Group under review by producer and consumer countries.

Argentina and Chile are signatories of the 1961 Antarctica Treaty and are among the seven countries making claims on Antarctica territories. In October 1985, Uruguay achieved Consultative Party status within the treaty. Argentina and Chile maintain research stations on Antarctica. Of all the claimant nations, Argentina has had the longest presence on Antarctica dating back to 1904. Argentina and Chile have signed the agreement called the Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA) negotiated by the Antarctica Treaty nations during the period 1982–88.

ARGENTINA[2]

Introduction

Argentina, the second largest country in Latin America, has a well-diversified natural resource base and great mineral potential. During almost three decades, the Government has directly or indirectly expended a considerable effort on exploration, generating the discovery of a number of mineral deposits, most of them small and medium size and polymetallic. But no followup investments have been made to develop these deposits. Mineral production and trade remain almost negligible in terms of the contribution to the gross domestic product (GDP) and to total exports. Total mineral exports, excluding hydrocarbons, were estimated at approximately 0.5%, and including hydrocarbons at about 3% of total exports.

The El Aguilar Mine in Jujuy Province, the largest lead, zinc, and silver mine in the country and the most significant privately owned mine in Argentina, was sold in February by Fluor Corp. (St. Joe Minerals Corp.) to the Bolivian Consortium Cía. Minera del Sur (COMSUR) for an undisclosed amount. This ended the only U.S. mining venture of any significance in the country. El Aguilar employed about 1,700 workers who operated a 2,000-ton-per-day underground mine and a flotation-type concentrator producing about 30,000 tons of zinc, 24,000 tons of lead in concentrates, and 1.6 million troy ounces of silver per year.

According to economic advisors, the

Argentine economy was considered to be overregulated, with the consequent presence of an underground economy. However, instead of deregulating the economy, the authorities appeared intent on more regulations. Although the Government has yet to release yearend figures, economic growth was slightly negative through the middle of the year, compared with 1987, when the growth rate was 1.6%. The World Bank has estimated that Argentine private deposits held outside of the country amounted to nearly $21 billion[3]. The Government has imposed several new economic programs since 1986, incorporating various elements of the original Plan Austral. The most recent program, the Plan Primavera, announced in August was designed to significantly lower the inflation rate. Although initial results have been favorable, critics argued that the program did not represent a basis for improved economic performance over the medium or long term and caused further distortions of the economy.

Government Policies and Programs

Argentine foreign investment laws were considered to be among the most open and liberal in Latin America. In general, foreign investors enjoy all the rights given to domestic investors. The Argentine Government initiated programs to attract and increase private investment in petroleum (Plan Houston, Plan Olivos, and Petroplán). Such programs, coupled with better management by Yacimientos Petroliferos Fiscales (YPF), was expected to result in increased petroleum production.

The Argentine Government, through its Secretariat of Mining, has designed and implemented a strategy known as the Mining Expansion Plan (Plan de Expanción Minera P.E.M). The plan's main objective was to improve the investment climate in the mineral sector by applying the Mining Promotion Law responsibly and generously to attract and encourage domestic and foreign investment in the mineral sector. The plan includes the establishment of a data bank to be used to evaluate new and potential ore bodies for development and to assist the owners of mining projects in contacting prospective investors outside of the sector. The Mining Promotion Law (Law 22,095), passed in November 1979, treats domestic and foreign investors equally. Beneficiaries are duly registered persons or legal entities qualified to act in Argentina. Benefits and incentives are in no way linked to the origin of ownership or percentage of equity. Tax incentives may be granted to national and international companies. Benefits will be based on the nature of the project and its compliance with the purposes of the Plan de Expanción Minera. Benefits to promote mining activities fall into three categories. One category involves exploration, development, preparation, and extraction of minerals. A second category involves crushing, grinding, processing, pelletizing, sintering, briqueting, roasting, smelting, refining, and other steps in ore treatment. The third category involves manufacture of primary products. A regional integration criterion is applied to all processing operations. In order to qualify for these incentives, a firm must integrate processing with the mining development phase. The law permits a 100% income tax deduction for expenses related to investments made in research, prospecting, and exploration, as well as mining license fees. The law also permits the same deduction for construction of roads, railroad siding, housing for personnel, and other infrastructure. Expenses for technical consultants are also included in this deduction. The Government introduced major changes in administering mining sector incentives. These incentives for investment, stated in the Mining Promotion Law, called for deferred taxation and tax breaks. The Law also formed the Fondo de Fomento Minero, a mining finance fund administrated by the Secretaría de Estado de Minería, (S.E.M.).

Production

Argentina continued to be one of the world's largest producers and exporters of borax. Also produced were modest quantities of base metals such as lead and zinc, industrial minerals such as bentonite, gypsum, and kaolin, and mineral fuels such as coal, coke, and crude oil. Production of precious metals was limited. The Secretariat of Mining reported a 4.7% decrease in production of gold to over 30,000 troy ounces in 1988 and an increase of 24% in silver to 2.4 million troy ounces compared with output of 1987. Production of internationally traded industrial minerals showed a sustained growth. Domestic demand remained stagnant. Production of construction materials, which included sand and gravel, granite, marble, and other building stones, was sensitive to investment in construction and remained fairly depressed. Cement output declined slightly. Yacimientos Carboniferos Fiscales (YCF) reported a 34% coal production increase. The production of crude oil and natural gas increased 4.3% and 16.6%, respectively.

Trade

The National Customs Administration and the National Institute of Statistics and Census reported the value of exported nonfuel minerals, mineral-related products, and metals to be approximately $38.4 million, an increase of 18% compared with that of 1987. The export value of crude oil and refinery products increased 98.0% to $205 million. The principal nonfuel mineral exports were lead concentrates, polymetallic concentrates containing gold and silver, borax, boric acid, granite, sodium borate, ulexite, and zinc concentrate. Other significant mineral products exported included bentonite, borates, celestite, portland cement, gypsum, and dimensional forms of granite and marble.

There were 200 different minerals and mineral-related products exported. Marble and granite showed promising

TABLE 1

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[e]
METALS						
Aluminum:						
Primary		r133,700	r135,700	r147,600	3155,800	3157,400
Secondary		7,500	r8,000	r6,500	37,500	7,500
Beryllium: Beryl concentrate:						
Gross weight		r72	31	50	46	40
BeO content		r7	3	5	5	4
Cadmium: Smelter		46	46	47	46	46
Columbium (Cb_2O_5)	kilograms	—	—	—	—	351
Copper: Mine output, Cu content		223	391	317	379	3475
Gold: Mine output, Au content	troy ounces	22,120	28,357	30,350	331,829	330,318
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	572	639	810	r567	3583
Fe content	do.	346	389	514	r360	3370
Metal:						
Pig iron and sponge iron	do.	1,799	2,999	2,600	32,785	32,755
Ferroalloys, electric-furnace:						
Ferromanganese		23,976	23,663	19,782	321,407	318,940
Ferrosilicomanganese		13,336	7,493	12,977	311,746	312,766
Ferrosilicon		19,932	18,790	22,979	323,998	325,983
Other		3,939	4,892	5,272	36,790	37,803
Total		**61,183**	**54,838**	**61,010**	r**63,941**	e**65,492**
Steel, crude	thousand tons	2,647	2,942	3,235	33,633	33,662
Semimanufactures[4]	do.	2,456	2,269	2,977	r3,912	33,012
Lead:						
Mine output, Pb content		28,542	28,582	r26,868	r26,069	328,721
Metal:						
Smelter, primary		16,300	15,088	r15,700	r16,200	319,000
Refined:						
Primary		r16,300	15,088	r15,700	r16,200	16,000
Secondary		15,000	13,575	r15,000	r16,000	16,000
Total		**31,300**	**28,663**	r**30,700**	r**32,200**	**32,000**
Manganese ore and concentrate:						
Gross weight		r5,888	7,276	9,886	36,393	39,657
Mn content		r1,443	1,728	2,458	31,324	32,000
Silver, mine output, Ag content	thousand troy ounces	1,984	2,170	2,134	31,918	32,382
Tin:						
Mine output, Sn content		274	451	379	3186	3446
Metal, smelter		292	135	365	e350	280
Tungsten, mine output, W content		37	17	20	15	20

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[e]
METALS—Continued						
Uranium, mine output, U_3O_8 content	kilograms	94,430	r148,956	r203,753	[3]112,499	155,000
Zinc:						
Mine output, Zn content		34,909	35,713	39,540	35,648	r36,297
Metal:						
Smelter:						
Primary		27,725	30,377	29,123	[3]31,900	29,000
Secondary		2,200	2,500	3,000	r2,600	2,400
Total		**29,925**	**32,877**	**32,123**	**34,500**	**31,400**
INDUSTRIAL MINERALS						
Asbestos		1,093	1,244	1,697	332	[3]294
Barite		44,170	55,753	58,617	29,300	[3]45,000
Boron materials, crude		142,880	158,252	191,871	184,786	[3]196,000
Cement, hydraulic	thousand tons	r5,224	r4,630	r5,553	r6,302	[3]6,048
Clays:						
Ball clay (plastic clay), n.e.s.	do.	1,870	1,595	1,580	644	[3]815
Bentonite		r125,703	147,065	146,191	108,595	110,000
Foundry earth		124,023	96,821	102,551	107,000	100,000
Fuller's earth (decolorizing clay)		3,611	1,743	e2,000	e2,000	2,000
Kaolin		90,545	73,802	117,378	128,500	[3]56,130
Laterite (aluminous)		31,902	32,086	38,816	44,548	[3]53,000
Refractory		70,250	38,388	72,185	47,834	45,000
Other[5]		665,615	524,267	1,596,852	2,275,826	1,400,000
Diatomite		5,227	9,929	14,362	4,586	10,000
Feldspar		17,948	27,066	24,087	29,282	25,000
Fluorspar		23,157	30,612	39,076	73,788	42,000
Graphite		15	32	40	216	100
Gypsum, crude		566,943	460,816	462,195	561,073	500,000
Lithium: Spodumene, amblygonite, gross weight		r25	35	184	178	[3]28
Mica:						
Sheet		12	347	234	340	[3]330
Waste and scrap		278	374	317	451	[3]450
Nitrogen: N content of ammonia		49,300	64,900	62,879	r71,829	[3]86,668
Phosphates: Thomas slag[6]		500	500	228	110	[3]55
Pigments, mineral, natural: Ocher		757	4,020	1,027	92	[3]850
Precious and semiprecious stones: Amethyst	kilograms	NA	NA	NA	NA	NA
Pumice and related volcanic materials		54,257	44,350	22,957	[3]195,526	80,000
Salt:						
Rock	thousand tons	1	1	1	1	1
Solar	do.	937	1,447	1,218	950	[3]835
Total	**do.**	**938**	**1,448**	**1,219**	**951**	**836**

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[e]
INDUSTRIAL MINERALS—Continued						
Sand and gravel:						
Sand:						
Construction	thousand tons	11,399	11,352	10,389	9,048	10,000
Ferruginous-titaniferous		NA	NA	NA	NA	NA
Silica sand (glass sand)	thousand tons	306	275	292	283	[3]285
Gravel	do.	4,301	3,745	5,552	3,574	3,500
Stone:						
Basalt	do.	r3,354	3,020	2,802	2,542	2,500
Calcareous:						
Calcite, nonoptical		7,100	8,220	7,687	2,800	3,500
Calcium carbonate (chalk)		8,585	12,629	13,448	7,200	7,600
Dolomite		211,270	97,146	254,966	379,473	[3]438,000
Limestone	thousand tons	11,167	10,064	10,166	13,910	13,000
Marble:						
Aragonite, broken		2,603	1,032	513	1,740	[3]2,220
Onyx, in blocks and broken		r13,592	11,041	9,351	9,020	9,000
Travertine, in blocks and broken		4,447	6,007	4,423	5,925	[3]11,117
Unspecified, in blocks and broken		92,282	71,042	98,227	72,179	[3]38,200
Flagstone		41,180	61,425	53,943	64,945	60,000
Granite:						
In blocks		25,359	32,948	30,424	43,934	[3]53,700
Crushed	thousand tons	4,144	3,653	3,747	3,548	[3]4,200
Quartz, crushed		96,420	81,213	126,255	133,517	110,000
Quartzite, crushed	thousand tons	996	1,105	580	2,128	2,000
Rhodochrosite		23	6	13	10	10
Sandstone		200	282	346	608	600
Serpentine, crushed		5,146	12,551	23,010	28,689	29,000
Shell, marl		556,949	431,990	320,898	618,536	500,000
Tuff and tufa	thousand tons	458	1,876	1,306	12,146	10,000
Strontium minerals: Celestite		400	983	1,133	1,010	1,000
Sulfates, natural:						
Aluminum (alum)		11,583	24,513	30,489	64,655	[3]65,000
Magnesium (epsomite)		r697	904	762	2,500	1,500
Sodium (mirabilite)		32,626	20,865	31,789	27,481	[3]11,344
Talc and related materials:						
Pyrophyllite		5,012	2,785	2,812	1,260	1,200
Steatite		NA	280	e300	e300	250
Talc		22,774	15,944	22,353	24,138	[3]25,400
Total		**27,786**	**19,009**	**25,465**	**25,698**	**26,850**
Vermiculite		4,451	4,887	5,207	952	20,200
Water, mineral-containing		85,436	100,720	151,998	177,544	173,150
Zeolite		90	103	120	110	100

See footnotes at end of table

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[e]
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural		994	3,235	3,702	[r]3,350	3,000
Coal, bituminous	thousand tons	509	400	[r]370	[r]380	[r]508
Coke, all types, including breeze	do.	[r]422	625	840	[3]700	700
Gas, natural:						
Gross	million cubic feet	675,757	658,605	677,407	[r]675,482	801,453
Marketed[4]	do.	[r]509,520	[r]525,059	[r]506,180	[r]521,552	629,686
Natural gas liquids:						
Butane	thousand 42-gallon barrels	2,605	3,132	3,170	[3]3,306	3,887
Propane	do.	3,497	2,996	3,030	[3]4,967	5,283
Total	do.	6,102	6,128	6,200	[3]8,273	9,170
Peat, agricultural (Turba)		2,308	3,917	3,166	[3]3,786	3,000
Petroleum:						
Crude	thousand 42-gallon barrels	175,097	167,781	158,467	[r]156,348	164,418
Refinery products:						
Gasoline	do.	43,817	34,785	31,35[r]	[r]31,246	28,041
Kerosene	do.	3,549	3,449	3,675	[r]3,778	3,503
Jet fuel	do.	5,143	4,685	5,028	[r]5,384	5,176
Distillate fuel oil	do.	57,265	45,801	51,429	[r]54,172	53,997
Residual fuel oil	do.	38,448	17,485	21,447	[r]25,734	27,790
Lubricants	do.	1,883	1,593	1,792	[r]1,868	1,781
Other	do.	8,565	10,417	16,148	[r]16,445	16,499
Refinery fuel and losses	do.	11,766	43,982	25,337	[r]14,205	21,400
Total	do.	170,436	165,197	156,207	[r]152,832	158,187

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.

[1]Table includes data available through Nov. 30, 1989.

[2]In addition to the commodities listed, bismuth, carbon black, columbite, iron, natural gasoline, perlite, and potassium sulfate (Kainite) are believed to be produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Hot-rolled semimanufactures only; excludes castings and cold-rolled semimanufactures produced from imported hot-rolled semimanufactures.

[5]Includes plastic, semiplastic, and/or ferruginous clays used totally in the manufacture of portland cement.

[6]Thomas slag production was estimated from the Thomas crude steel reported in La Siderurgia Argentina annual published by the Instituto Argentino de Siderurgia.

[7]Includes 79,650 million cubic feet of natural gas imported from Bolivia.

trends in foreign markets. Brazil remained the single largest importer of Argentine minerals, accounting for approximately 60% of the total. Other important mineral markets included the United States, Japan, Eastern Europe, and the U.S.S.R.

According to Government import figures, the value of imports of minerals and basic manufactured items derived from mineral substances amounted to nearly $840 million. Mineral imports accounted for almost 20% of total imports, of which industrial minerals, namely asbestos, kaolin, magnesium, and sulfur, accounted for almost 80%. Iron ore and manganese were imported for the steel industry. Imports of natural gas from Bolivia increased 5% to 79 billion cubic feet with an estimated value of $215 million. Imports of metallurgical coal from the United States and other countries increased 4% to an estimated 1.1 million tons.

Commodity Review

Metals.—**Aluminum.**—Primary aluminum in Argentina was produced by Aluminios Argentinos S.A.I.C. (ALUAR). ALUAR'S refinery in Puerto Madryn, Chubut Province, was 52.1% owned by the state and 47.9% by private investors. The refinery has an installed capacity of 160,000 tons per year of primary aluminum and employs more than 1,200 workers. Sev-

TABLE 2

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	Destinations, 1987	
				United States	Other (principal)
METALS					
Aluminum:					
Oxides and hydroxides		1	1	—	Mainly to Uruguay.
Metal including alloys:					
Unwrought		74,000	73,009	18,517	Japan 32,400; Netherlands 6,239.
Semimanufactures		13,469	17,995	4,810	Netherlands 9,195; Japan 1,643.
Chromium: Oxides and hydroxides		13	38	—	Chile 29; Venezuela 5; Uruguay 4.
Copper: Metal including alloys:					
Unwrought		1	2	—	Mainly to Uruguay.
Semimanufactures		3,144	3,217	2,441	Iran 484; Israel 131.
Iron and steel: Metal:					
Scrap		9	—		
Pig iron, cast iron, related materials		45	715	—	Uruguay 481; Brazil 100; Italy 80.
Ferroalloys		9,840	16,511	12,516	Japan 3,199; United Kingdom 432.
Steel, primary forms		369,796	132,360	26,787	China 50,345; India 17,505.
Semimanufactures:					
Bars, rods, angles, shapes, sections		249,578	193,648	43,084	China 46,938; Chile 28,032.
Universals, plates, sheets		315,539	379,387	208,976	Japan 51,115; Thailand 45,958.
Hoop and strip		178	9	—	Uruguay 8; Bolivia 1.
Rails and accessories		NA	530	—	Paraguay 405; Colombia 116; Bolivia 9.
Wire		3,795	4,410	1,630	Bolivia 1,108; Uruguay 702.
Tubes, pipes, fittings		228,217	330,833	110,079	China 89,090; U.S.S.R. 54,665.
Castings and forgings, rough		196	39	—	Bolivia 25; Uruguay 9; Chile 5.
Lead:					
Ore and concentrate		17,080	19,727	—	Brazil 6,807; France 5,001; U.S.S.R. 4,200.
Oxides		83	49	—	All to Uruguay.
Metal including alloys:					
Unwrought		50	400	—	Do.
Semimanufactures	value, thousands	1	$6	—	All to Libya.
Magnesium: Metal including alloys, semimanufactures		—	1	—	All to Uruguay.
Manganese: Oxides		—	2	—	All to Bolivia.
Nickel: Metal including alloys, semimanufactures	value, thousands	$15	$2	—	All to Libya.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:					
Platinum	do.	$1	—		
Silver: Waste and sweepings	do.	—	$10	—	Italy $9; West Germany $1.
Tin:					
Ore and concentrate		3	190	—	Netherlands 185; Paraguay 5.
Metal including alloys, semimanufactures		1	1	—	Mainly to Uruguay.
Titanium: Oxides	value, thousands	—	$1	—	All to Chile.
Tungsten: Metal including alloys, all forms	do.	$11	—		

See footnotes at end of table.

TABLE 2—Continued

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Destinations, 1987	
			United States	Other (principal)
METALS—Continued				
Zinc:				
Ore and concentrate	7,602	1,679	—	All to Brazil.
Oxides	341	278	—	Brazil 200; Chile 47; Uruguay 30.
Metal, including alloys:				
Unwrought	762	—		
Semimanufactures	11	2	—	All to Uruguay.
Other:				
Ores and concentrates	50	—		
Ashes and residues		10	10	
Base metals including alloys, all forms	NA	89	—	Mainly to Brazil.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	82	754	—	Uruguay 518; Spain 193; Paraguay 23.
Artificial: Corundum	—	1	—	All to Uruguay.
Grinding and polishing wheels and stones	4	13	—	Brazil 8; Uruguay 3; Chile 1.
Asbestos, crude	15	38	—	All to Uruguay.
Barite and witherite	530	676	—	Bolivia 500; Paraguay 100; Uruguay 76.
Boron materials:				
Crude natural borates	12,682	17,351	—	Brazil 16,739; Uruguay 12.
Oxides and acids	6,912	6,738	—	Brazil 4,776; Italy 773; Netherlands 632.
Cement	48,727	33,054	—	Bolivia 14,478; Brazil 9,530; Chile 8,943.
Chalk		5	—	All to Uruguay.
Clays, crude	19,310	11,539	4	Brazil 7,977; Chile 1,776; Uruguay 1,083.
Diatomite and other infusorial earth	42	50	—	Uruguay 40; Paraguay 10.
Fluorspar: fluorspar related materials	93	319	—	Chile 180; Uruguay 84; Paraguay 55.
Fertilizer materials, Manufactured:				
Ammonia	397	456	—	Uruguay 456; Paraguay 2.
Nitrogenous	4,279	300	—	Bolivia 170; Paraguay 100; Uruguay 90.
Phosphates	20	—		
Potassic	6			
Unclassified and mixed	940	2,159	—	Paraguay 1,760; Bolivia 390; Dominican Republic 7.
Gypsum and anhydrite	10,065	12,350	—	Paraguay 11,155; Uruguay 1,189; Nicaragua 3.
Lime	8,216	5,430	—	Chile 5,149; Bolivia 281.
Magnesium compounds, Magnesite, crude	26	100	—	All to Chile.
Mica:				
Crude, including splittings and waste	43	16	—	Chile 9; Bolivia 7.
Worked, including agglomerated splittings, value, thousands	—	$8	—	Uruguay $5; Bolivia $3.
Pigments, mineral: Iron oxides and hydroxides, processed	121	362	—	Uruguay 122; Colombia 71; Singapore 65.
Precious and semiprecious stones other than diamond, natural, value, thousands	$152	$201	$2	West Germany $114; Hong Kong $49; Japan $22.

[1] Includes re-exports.

TABLE 2—Continued

ARGENTINA: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Destinations, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Salt and brine	12,738	130,608	3	Brazil 126,108; Uruguay 2,380; Paraguay 2,117.
Sodium compounds, n.e.s.: Carbonate, manufactured	100	46	—	Uruguay 43; Paraguay 3.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,406	3,083	28	Italy 1,825; Japan 598; Spain 306.
Worked	1,940	2,045	1,165	New Zealand 212; Japan 208.
Dolomite, chiefly refractory-grade	473	948	—	Chile 733; Brazil 150; Italy 46.
Gravel and crushed rock	13	5	—	All to Uruguay.
Quartz and quartzite	2	145	—	Bolivia 98; Uruguay 40; Paraguay 2.
Sand other than metal-bearing	20	—		
Sulfur:				
Elemental, crude including native and byproduct	41	195	—	Paraguay 165; Uruguay 30.
Sulfuric acid	2,955	2,136	2,112	Bolivia 23; Uruguay 1.
Talc, steatite, soapstone, pyrophyllite	98	30	—	All to Chile.
Other:				
Crude	9,375	11,226	—	Brazil 11,173; Chile 50; Uruguay 3.
Slag and dross, not metal-bearing	86	59	—	All to Belgium-Luxembourg.
MINERAL FUELS AND RELATED MATERIALS:				
Asphalt and bitumen, natural	513	532	—	Chile 400; Brazil 132.
Carbon black	153,056	88,898	—	Brazil 45,671; U.S.S.R. 16,347; Netherlands 13,928.
Coal: All grades excluding briquets	3	9	—	All to Uruguay.
Coke and semicoke	82,707	53,032	—	Belgium-Luxembourg 52,618; Paraguay 407; Uruguay 7.
Peat including briquets and litter	13	—		
Petroleum:				
Crude: thousand 42-gallon barrels	948	599	599	
Refinery products:				
Liquefied petroleum gas: do.	234	7	—	All to Paraguay.
Gasoline, motor: do.	674	268	7	Paraguay 209; Chile 33; Uruguay 16.
Mineral jelly and wax: do.	55	66	—	Chile 21; Peru 16; Netherlands 13.
Kerosene and jet fuel: do.	149	293	205	Paraguay 88.
Distillate fuel oil: do.	1,320	526	(2)	Paraguay 524; West Germany 1.
Lubricants: do.	81	101	—	Uruguay 86; Paraguay 8; Bolivia 2.
Residual fuel oil: do.	4,743	2,231	2,119	Paraguay 80; Iran 6.
Bitumen and other residues: do.	78	75	—	Paraguay 43; Chile 23; Uruguay 9.
Bituminous mixtures: do.	3	1	—	Mainly to Paraguay.
Petroleum coke: do.	555	307	—	Canada 182; Netherlands 117; Uruguay 7.

NA Not available.
Table prepared by H.D. Willis.
Less than ½ unit.

TABLE 3

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	Sources, 1987	
				United States	Other (principal)
METALS					
Alkali and rare-earth metals		21	19	8	Canada 4; France 4.
Aluminum:					
Ore and concentrate		25,739	31,325	33	China 18,870; Brazil 9,123; Guyana 3,145.
Oxides and hydroxides		356,839	239,225	995	Australia 223,989; Brazil 12,280.
Metal including alloys:					
Unwrought		11	21	—	Brazil 15; West Germany 5; Italy 1.
Semimanufactures		1,108	8,814	155	Brazil 8,041; Uruguay 121.
Antimony: Oxides[2]		1	12	NA	NA.
Cadmium: Oxides and hydroxides[2]		64	59	NA	NA.
Chromium:					
Ore and concentrate		15,572	27,558	2	Republic of South Africa 25,546; Cuba 2,008.
Oxides and hydroxides	value, thousands	$1	$13	$11	West Germany $1; Italy $1.
Cobalt: Oxides and hydroxides		11	29	21	Netherlands 4; Republic of South Africa 2.
Columbium and tantalum: Metal including alloys, all forms: Tantalum	value, thousands	$22	$27	$19	West Germany $8.
Copper:					
Ore and concentrate		—	1	—	All from Switzerland.
Oxides and hydroxides[2]		1	—		
Metal including alloys:					
Scrap		80	106	—	All from Israel.
Unwrought		48,222	50,987	96	Chile 45,712; Peru 5,138.
Semimanufactures		1,042	1,420	129	Japan 394; West Germany 326; Brazil 293.
Iron and steel:					
Iron ore and concentrate:					
Excluding roasted pyrite	thousand tons	3,128	3,342	(3)	Brazil 2,919; Venezuela 236; Peru 181.
Pyrite, roasted		5,567	4,203	—	All from Brazil.
Metal:					
Scrap		1,068	671	41	Japan 265; Belgium-Luxembourg 155; Italy 89.
Pig iron; cast iron; related materials		1,470	17,800	782	Venezuela 16,255; Brazil 476.
Ferroalloys:					
Ferromanganese		1,302	2,913	—	Brazil 2,168; Netherlands 340; Sweden 240.
Unspecified		2,536	4,079	246	Republic of South Africa 2,708; Brazil 591.
Steel, primary forms		421,094	401,000	12	Brazil 118,930; Italy 80,123; Republic of South Africa 62,248.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS—Continued				
Iron and steel—Continued				
Metal—Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections	17,277	18,100	290	West Germany 5,456; Uruguay 4,097; Brazil 3,999.
Universals, plates, sheets	97,045	257,948	4,476	Japan 125,090; Brazil 53,026; Belgium-Luxembourg 26,071.
Hoop and strip	4,153	5,782	385	Belgium-Luxembourg 1,522; Japan 916; Brazil 782.
Rails and accessories	437	436	153	Belgium-Luxembourg 253; West Germany 14.
Wire	4,528	4,657	14	Uruguay 2,404; Brazil 1,237; France 205.
Tubes, pipes, fittings	8,290	72,870	445	Mexico 61,992; Italy 4,317; Sweden 2,239.
Castings and forgings, rough	33	34	2	Brazil 12; Japan 12; West Germany 6.
Lead:				
Oxides	—	180	10	Peru 110; Mexico 60.
Metal including alloys:				
Scrap	—	35	—	All from Chile.
Unwrought	10	172	—	Uruguay 160; Belgium-Luxembourg 12.
Semimanufactures	3	1	(3)	Mainly from Netherlands.
Lithium: Oxides and hydroxides[2]	170	124	NA	NA.
Magnesium: Metal including alloys:				
Unwrought	840	746	426	West Germany 151; Norway 142.
Semimanufactures	63	67	60	West Germany 5; Uruguay 2.
Manganese:				
Ore and concentrate	50,578	60,353	93	Brazil 39,218; Congo 21,000.
Oxides	790	631	154	Brazil 455; Netherlands 20.
Mercury 76-pound flasks	6,150	1,305	—	Mexico 870; Netherlands 290; Spain 145.
Molybdenum: Metal including alloys, all forms	5	4	1	Austria 2; West Germany 1.
Nickel:				
Matte and speiss	29	17	(3)	Mainly from Cuba.
Oxides and hydroxides[2]	110	24	NA	NA.
Metal including alloys:				
Unwrought	538	844	148	Netherlands 488; Canada 75.
Semimanufactures	150	256	82	West Germany 41; Netherlands 35.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Platinum value, thousands	$532	$340	$40	West Germany $213; Spain $72.
Silver: Metal including alloys, unwrought and partly wrought do.	$2,924	$2,884	$1	Belgium-Luxembourg $2,714; West Germany $82; Peru $45.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS—Continued				
Tin:				
Ore and concentrate	131	161	—	All from Bolivia.
Metal including alloys:				
Unwrought	1,344	727	—	Brazil 669; Bolivia 58.
Semimanufactures	15	24	23	West Germany 1.
Titanium: Oxides	1,037	1,085	37	Belgium-Luxembourg 595; West Germany 216; Netherlands 91.
Tungsten:				
Ore and concentrate	10	97	—	Bolivia 79; Netherlands 18.
Metal including alloys, all forms	30	9	5	West Germany 2; Brazil 1.
Zinc:				
Oxides	35	20	1	Uruguay 17; West Germany 11.
Metal including alloys:				
Scrap	—	34	—	All from Peru.
Unwrought	4,457	5,867	—	Mexico 3,296; Spain 1,299; Peru 552.
Semimanufactures	77	46	1	Mexico 34; Italy 10.
Other:				
Ores and concentrates	2,541	2,659	65	Republic of South Africa 1,887; Bolivia 680.
Oxides and hydroxides	57	75	26	West Germany 31; Italy 13.
Ashes and residues	—	24	—	All from Chile.
Base metals including alloys, all forms	234	339	228	Republic of South Africa 31; Belgium-Luxembourg 21.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	185	290	290	
Artificial: Corundum	6,931	6,961	85	Brazil 6,503; France 177; West Germany 111.
Dust and powder of precious and semiprecious stones, value, thousands	$558	$750	$667	Belgium-Luxembourg $65; Norway $11.
Grinding and polishing wheels and stones	188	209	9	Italy 130; Brazil 44; West Germany 21.
Asbestos, crude	12,701	14,324	235	Brazil 6,568; Canada 3,958; Republic of South Africa 3,116.
Barite and witherite	259	1,577	62	Bolivia 1,510; West Germany 5.
Bromine[2]	19	24	NA	NA.
Cement	1,048	1,176	91	France 427; Brazil 408; Netherlands 115.
Chalk	2	1	—	All from West Germany.
Clays, crude	25,056	34,118	14,698	Brazil 16,182; Italy 3,001.
Cryolite and chiolite	11	28	—	Denmark 25; Belgium-Luxembourg 3.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	Sources, 1987	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Diamond:					
Gem, not set or strung	value, thousands	$2	—		
Industrial stones	do.	$375	$468	$81	Belgium-Luxembourg $317; Switzerland $35.
Diatomite and other infusorial earth		2,300	1,822	173	Mexico 986; Chile 663.
Fertilizer materials:					
Crude, n.e.s.		15	—		
Manufactured:					
Nitrogenous		49,165	59,470	9,568	Bulgaria 16,975; U.S.S.R. 10,996.
Phosphatic		29,348	34,911	12,531	Turkey 13,000; Brazil 3,880.
Potassic		19,518	20,651	5,914	Canada 5,500; East Germany 3,731.
Unspecified and mixed		93,894	65,421	60,348	Chile 2,025; Belgium-Luxembourg 1,728.
Graphite, natural		392	435	38	Brazil 241; Austria 40.
Gypsum and plaster		11	6	4	Japan 2.
Iodine[2]		20	16	NA	NA.
Lime		105	—		
Magnesium compounds: Magnesite, crude		15,812	20,179	54	Brazil 10,687; Mexico 6,469; China 2,046.
Mica:					
Crude including splittings and waste		2	2	2	
Worked including agglomerated splittings		6	13	3	France 3; Brazil 2.
Nitrates, crude		2,575	3,900	—	All from Chile.
Pigments, mineral: Iron oxides and hydroxides, processed		68	83	45	West Germany 30; Belgium-Luxembourg 6.
Precious and semiprecious stones other than diamond:					
Natural	value, thousands	$44	$21	—	Brazil $19; Uruguay $2.
Synthetic	do.	$8	$89	$71	Switzerland $10; Belgium-Luxembourg $6.
Pyrite, unroasted		3	40	—	All from West Germany.
Salt and brine		44	33	10	Belgium-Luxembourg 11; Netherlands 4.
Sodium compounds, n.e.s.:					
Carbonate, natural and manufactured		197,847	199,572	66,825	Belgium-Luxembourg 68,068; Romania 27,370.
Sulfate, natural and manufactured[2]		r2,727	2,384	NA	NA.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		3,347	1,453	—	Brazil 842; Uruguay 451; Italy 139.
Worked		575	659	—	Italy 250; Uruguay 200; Spain 198.
Dolomite, chiefly refractory-grade		463	350	—	All from Brazil.
Gravel and crushed rock		71,415	160,654	—	Paraguay 95,699; Uruguay 64,950; France 5.
Quartz and quartzite		127	281	—	Sweden 238; Belgium-Luxembourg 33; Brazil 10.

See footnotes at end of table.

TABLE 3—Continued

ARGENTINA: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	Sources, 1987	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Stone, sand and gravel—Continued					
Sand other than metal-bearing		(4)	211,024	9,127	Uruguay 199,944; Brazil 1,952.
Sulfur:					
Elemental:					
Crude including native and byproduct		110,571	105,896	11,990	Canada 89,905; Colombia 4,000.
Colloidal, precipitated, sublimed		23	22	21	West Germany 1.
Sulfuric acid		5,174	2,287	—	Mainly from Uruguay.
Talc, steatite, soapstone, pyrophyllite		382	1,049	31	China 782; Uruguay 94; Brazil 84.
Other:					
Crude		5,609	7,637	364	Brazil 4,388; Belgium-Luxembourg 910; Republic of South Africa 848.
Slag and dross, not metal-bearing		365	368	2	Brazil 216; Uruguay 150.
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural		133	77	77	
Carbon black		767	617	378	West Germany 81; Belgium-Luxembourg 73.
Coal:					
Anthracite and bituminous excluding briquets	thousand tons	1,092	1,110	663	Poland 212; Australia 181.
Lignite including briquets		100	100	100	
Gas, natural	million cubic feet	78,204	74,906	—	All from Bolivia.
Peat excluding briquets and litter[2]		20	100	NA	NA.
Petroleum:					
Crude	42-gallon barrels	7	—		
Refinery products:					
Liquefied petroleum gas	do.	12	1,467,608	—	Algeria 509,971; Saudi Arabia 309,662; United Arab Emirates 98,565.
Gasoline, motor	do.	6,621	1,126,539	2,661	Netherlands 747,558; Brazil 237,226; Tunisia 138,490.
Mineral jelly and wax	do.	6,390	7,114	2,330	Brazil 3,038; Spain 897.
Kerosene and jet fuel	do.	39	1,461,774	8	Italy 360,600; Spain 350,726; Brazil 333,332.
Distillate fuel oil	do.	—	4,003,752	485,862	Saudi Arabia 836,259; U.S.S.R. 553,741.
Lubricants	do.	28,553	477,722	6,972	Brazil 191,338; Spain 183,925; Italy 43,085.
Residual fuel oil	do.	—	5,126,955	751,275	U.S.S.R. 1,393,239; Trinidad and Tobago 808,064.
Bitumen and other residues	do.	—	109	—	All from West Germany.
Bituminous mixtures	do.	61	—		
Petroleum coke	do.	28	847	847	

[1] Revised. NA Not available.
[2] Table prepared by H. D. Wills.
[3] Estadística Minera de la Republica Argentina, 1988.
[4] Less than 1/2 unit.
[5] Quantity not available; valued at $627,000.

eral firms were involved in converting primary aluminum ingots into different aluminum products. These firms included Camea S.A., Uboldi S.A., and Kicsa. Kicsa, which was the most important in the production of aluminum products, employed more than 600 workers. In 1987, Kisca spent $7 million to expand its rolling mill. In 1988, Kicsa planned to introduce more modern equipment, for a total investment of $22 million, to double aluminum foil output and to produce aluminum cans for beverages. The company expected that the domestic demand for primary aluminum would increase by an estimated 10,000 tons per year.

Copper.—By yearend, the Provincial government of Mendoza planned to auction the Paramillos Sur copper deposit. Bids, which were open to both national and foreign companies, were to be presented to the Dirección de Minería in Mendoza by October 31. The winner would have to pay 25% of the value immediately and the balance within 24 months. The Paramillos Sur deposit, 75 kilometers north of the Provincial capital, Mendoza, has not been mined since the 1960's. Studies, during the 1964–68 period, under the "Plan Cordillerano," indicated 186 million tons of ore reserves with an average grade of 0.58% copper with economically recoverable gold and molybdenum values.

The Paramillos Sur copper deposit consists of nine concessions of 100 hectares each. Development of the El Pachón copper project also has been delayed several times. In 1984, El Pachón S.A. invited several firms to study the feasibility of producing copper through the application of bacterial leaching. The results indicated that El Pachón ore would be amenable to this method of processing. At yearend, the company was updating estimated investment costs for the El Pachón project. The proposed project would consist of an open pit mine, a modular pad complex to leach the copper, and a solvent extraction electrowinning plant to produce metallic copper for domestic consumption. Plans were to operate at an annual rate of 30,000 tons of metallic copper. According to the current measured ore reserves, the mine would have a life of 80 years. The total cost for the El Pachón project, using the bacterial leaching process, was estimated at $140 million, including preproduction expenditures, initial working capital, miscellaneous items, and inflated costs up to the year 1989.

Gold and Silver.—The Farallón Negro Mine in Catamarca Province and the Angela Mine in Chubút Province were the main sources of gold output. Silver output increased 24.3% to 2.4 million troy ounces. The Farallón Negro Mine and other properties in the mining district are owned by Yacimientos Mineros Agua de Dionisio (YMAD), a state enterprise that is controlled by the Provincial governments of Catamarca and Tucumán. The district, in addition to the Farallón Negro Mine, includes the large Bajo de la Alumbrera copper-gold-silver-molybdenum deposit, the Alto de la Blenda lead-zinc-silver deposit, the Cerro Atajo, and the La Josefa gold-copper deposits. In 1987–88, YMAD built a 9,000-square-meter heap-leaching pad at the Farallón Negro Mine to process low-grade ores, previously discarded as waste. YMAD also continued to study the Bajo de la Alumbrera polymetallic deposit, 4 miles southeast of Farallón Negro to recover gold on a pilot basis using the heap-leaching facilities available at Farallón Negro Mine.

Cerro Castillo S.A., an operator in Río Negro Province, projected that the company would increase the country's gold output by one-third in 1989. The gold is a byproduct of its beneficiation process which also produces lead, zinc, copper, and silver concentrate. The company mines about 80,000 tons of ore per year, recovers 3,000 tons of polymetallic concentrates and 7,000 tons of zinc concentrate, and earned more than $6 million in exports in 1988.

BHP-Utah International Minerals, based in San Francisco, California, United States, presented an investment and exploration proposal to the mining authorities of Córdoba Province. BHP-Utah proposed to finance a precious metals exploration program in the Cruz del Eje region in Córdoba Province, where the Mining Secretariat discovered promising occurrences. The Mining Secretariat, through a technical and legal commission, is currently studying BHP-Utah's proposal.

The Provincial government of Neuquén, in south-central Argentina, and the Dirección General de Fabricaciones Militares (DGFM), a state enterprise, announced a public tender for a feasibility study, with an option for exploitation and beneficiation of gold deposits, in reserve areas of the Andacollo District, Minas Chos Malal in Neuquén Province. The Corporación Minera de Neuquén Sociedad del Estado Provincial (CORMINE S.E.P), holders of the mining concession, announced that the bid packages would be opened on January 10, 1989. The area to be studied covers more than 100,000 hectares in the districts of Las Ovejas, Narvarco, Las Lagunas, and Cerro Mayal.

Compañía Minera Tea S.A. and Unión Transitoria de Empresas, a partnership formed by Cía. Minera Aguilar S.A. and Kantek S.A., invested $7 million to explore a gold deposit in the Andacollo district, in west-central Argentina near the Chilean border.

Several domestic and international firms showed an interest in exploring the Cerro Vanguardia gold deposit located 110 kilometers northeast of the port of San Julian in southern Argentina. This gold deposit was discovered by the Provincial government of Santa Cruz, and according to preliminary studies, it assays 12 grams per ton. Fomento Minero de Santa Cruz (FOMICRUZ) was set up to coordinate all exploration and development programs in the deposit area. Canadian and South African firms reportedly had expressed an interest in the Cerro Van-

guardia gold deposit.

The Swedish state mining agency Sveriges Geologiska and Yacimientos Mineros Riojanos-Sociedad de Economía Mixta (YAMIRI-SEM) signed an agreement with the government of La Rioja Province, in northern Argentina, to carry out a feasibility study on the gold-bearing deposits at Sierra de las Minas, Rosario Vera Peñaloza, and Ulapes in the Department of San Martin. This is the second agreement signed between the two firms and the state; the first was for the exploration and development of the La Mejicana gold deposit in La Rioja Province in 1987.

The French agency Bureau de Recherches Geologiques et Minieres (BRGM) concluded the first stage of a lead-silver-nickel deposit study in La Rioja Province. Future efforts will concentrate on prospecting for gold, silver, lead, platinum, and zinc deposits in the northeastern, northwestern, and western regions of Argentina. The French technicians will be assisted by specialists from the Mining Secretariat and from each region taking part in the study. The program will span an 18-month period.

A technical group of geologists and mining engineers from the Federal Republic of Germany's agency for technical cooperation collected data for an analysis of the Hualilál gold deposit in San Juan Province and La Florida tungsten deposit in San Luís. The group will prepare a feasibility study for both projects.

Iron Ore.—The primary sources of iron ore included Zapla deposit in Jujuy Province and Sierra Grande deposit in Río Negro Province. The iron ore extracted in Zapla was fed to the Altos Hornos Zapla steel plant, and the ore from Sierra Grande was transformed into iron ore pellets for the Sociedad Mixta Siderurgia Argentina (SOMISA) steel plant. The balance of output was used for the elaboration of high density drilling mud and cement. However, the national production of iron ore concentrate and pellets was not sufficient to satisfy the increasing demand from the production of primary iron (pig iron and sponge iron). As a result, the country had to import iron ore from Brazil, Venezuela, and Peru. According to the Instituto Argentino de Siderurgia, the national consumption of iron ore in different forms was over 2 million tons, of which 23% was imported in the form of pellets and 38% was in the form of sinter and 38% was in the form of iron ore, with a total value of $85 million.

Iron and Steel.—Steel production appeared to have been affected during the first semester by the shutdown of one of SOMISA's blast furnaces for almost 4 months. Sales of steel products declined from 2.1 million tons in 1987 to 1.9 million tons in 1988, and steel exports increased from 980,000 tons in 1987 to 1.4 million tons in 1988. The principal iron and steel producers in Argentina were SOMISA, Industria Argentina de Aceros S.A. (ACINDAR S.A.), SIDERCA (Formerly Dálmine Siderca) Propulsora Siderúrgica S.A.I.C., Establecimientos Altos Hornos Zapla (DGFM), Aceros Bragado S.A.C.I.F., Hierro Patagónico de Sierra Grande S.A.M. (HIPASAM), La Cantábrica S.A. Metalúrgica Industrial y Comercial, and La Basconia S.A. During the past decade, the Argentine steel industry experienced transformation and technological improvements that have enabled it to compete economically in international markets. Output has been adequate to satisfy domestic demand with a great variety of high-quality products, as well as to substitute for imported steel products.

Faced with the likelihood of a continuing decline in domestic steel demand in 1988, Argentine steel producers were seeking to increase exports in order to maintain production rates. The producers export annually more than 1 million tons of steel products or about one-third of the country's total output.

Domestic steel consumption declined in 1988 because the Government's new economic program, introduced in October 1987, continues to depress the economy through a price and wage freeze. Restrictions on iron and steel imports were ended and replaced with a 20% ad valorem tax on the f.o.b. price.

Steel has become the leading export commodity from the industrial sector. From export revenues of $150 million in 1980, the total reached nearly $700 million in 1988; 1989 figures were expected to be around the $900 million level. In 1988, SOMISA and SIDERCA were the two leading steel producers in the country with exports valued at $122 and $120 million, respectively, followed by Propulsora Siderúrgica with $60 million and ACINDAR with $50 million.

A sales contract for $380 million was signed between SIDERCA and China National Metals and Minerals Imports and Export Corp. (MINMETALS) as part of a trade agreement reached between the two countries. Under the agreement, Argentina will supply China with 380,000 tons of oil transport pipeline over 3 years, to be distributed as follows: 100,000 tons in 1989; 130,000 tons in 1990; and 150,000 tons in 1991.

***Industrial Minerals.*—Bentonite.**—Argentina is the only country in Latin America that exports natural sodium bentonite. Minarmco S.A., owned by ARMCO of the United States, is the largest and most modern producer of bentonite in Argentina. Competing with Minarmco are four major companies based in Neuquén and Río Negro Provinces, plus several smaller companies in San Juan and Mendoza Provinces. Minarmco began to produce bentonite in 1982, and initiated exports in 1986. In 1988, Minarmco produced 30,000 tons of bentonite of which 3,000 tons was exported. National production of bentonite declined 25% from the peak year of 1985. Total domestic demand for bentonite was approximately 80,000 tons per year. Argenti-

na's exports of bentonite went primarily to Brazil and, to a lesser extent, to Chile, Uruguay, and others. Exports to Brazil are exclusively for metal casting because Petroleos Brasileiros purchases activated calcium bentonite produced in Brazil. Minarmco and other producers are expected to begin exporting bentonite to the Middle East petroleum producing countries.

Boron.—According to estimates, Argentina ranked fourth in the world as a boron producer after the United States, Turkey, and the U.S.S.R. Production of boron minerals increased by 6% compared with that of 1987. In terms of foreign exchange generated, this industry ranked first among all mining industries in the country. More than 90% of the boron minerals and derivatives produced in Argentina, mainly sodium borate, and 67% of the boric acid output were exported. Brazil was the largest importer of Argentine borates; smaller amounts went to Uruguay, Chile, Mexico, Bolivia, the Netherlands, Venezuela, the Republic of South Africa, Italy, and the Federal Republic of Germany. The largest boron mineral producer in Argentina was Cía. Boroquímica S.A.M.I.C.A.F., owned by Río Tinto Zinc Corp. Ltd. and Industrias Químicas Baradero S.A. Boroquímica has an installed annual capacity of 37,000 tons at its plants in Campo Quijano and Tincalayu in the Province of Salta. Exports from Argentina reached 26,500 tons in 1988. Borates were produced from hydrous borocite (magnesium borate), tinkal (sodium borate), colemanite or borocalcite (calcium borate), and ulexite (sodium and calcium borate). The largest boron deposits in Argentina are in the Andean region in the Provinces of Catamarca, Jujuy, and Salta. Studies of these minerals indicate that there are similarities between the boron deposits in Kirka, Turkey, and the Argentine Tincalayu deposit, and between the Birgadic and Emet, Turkey, deposits and those of pastos Grandes in Argentina. The Kramer deposit in the United States is also similar to the Kirka and Tincalayu deposits.

Granite.—Production of granite blocks and in crushed form increased 22% and 30%, respectively, compared with that of 1987. The production of granite in blocks takes place in quarry operations located in Buenos Aires, Córdoba, Río Negro, La Rioja, and San Luis Provinces. The largest granite block producers are: Cía., Carlos Campolonghi S.A., in Buenos Aires and San Luis Provinces; Leme A. Mena y Cía. and Corp. Cementera Argentina, in Córdoba; and Alessandrini Hnos., in Río Negro Province.

Approximately 90% of the crushed granite comes from the Provinces of Buenos Aires, Córdoba, and Santiago del Estero.

Exports of granite, generally in the form of blocks approximately 3 by 1.30 by 0.80 meters, are mostly to Italy, Japan, France, Spain, Israel, the Federal Republic of Germany, and Singapore. Granite manufactures are exported as polished sheets or plates and floor tile, paving tile, or flagstone to Japan, the United States, Saudi Arabia, Canada, Australia, and the United Arab Emirates. The value of these exports was $1.4 million in 1988.

Four technicians from the Italian firm Technostone have been in Córdoba Province putting together a plan for a survey of the granite resources in the Province. Work will take place in the Cruz del Eje Department, where the second stage of the project will begin with the installation of a granite pilot plant in Villa de Soto. It was expected that the volume of high-quality granite reserves in the area will be higher than previously thought and could turn the province into a leading national producer. Relevant construction and infrastructure will be extended by Argentine companies, with the exception of a 5,000-square-meter storehouse, which Technostone will ship from Italy.

***Mineral Fuels.*—Coal.**—Production of bituminous coal rebounded from the depressed levels of prior years. Yacimientos Carboníferos Fiscal (YCF), the country's coal producer, mines coal from the Río Turbio Mine, which is in the southwest corner of Santa Cruz Province, 16 kilometers east of the Chilean Port of Puerto Natales. Under a 5-year plan for the exploration of Argentine coal reserves in the Patagonia region, YCF planned to increase annual coal production to 650,000 tons by 1988 and to 1.6 million tons by 1992. Thus, 1988 production fell short of the level expected by the company. Argentina's potential coal reserves were estimated in 1988 at more than 5 billion tons of probable steam coal. This was in addition to the proven reserves currently under exploitation in Río Turbio.

By yearend, the Secretariat of Energy reported that proven steam coal reserves in the Río Turbio Mine increased by 32% to 182 million tons. The 5-year exploration program, which ended in August, was financed by a $10 million loan from the World Bank and additonal assistance of $10 million from the National Energy Fund. The exploration program included the coalbeds in an area known as the Cancha Carrera in Río Turbio. The program also included a feasibility study of mining the coking coal reserves with financial assistance from the National Energy Fund and from the Argentine Steel Institute. The goal of the project was to eliminate imports of coking coal, which reached a level of more than 1,000,000 tons at a cost of over $50 million.

Natural Gas.—Natural gas production increased almost 19% to a record high. To supplement domestic natural gas production, Argentina imported an estimated 78,700 million cubic feet of gas from Bolivia, 5.1% more than in 1987, for an estimated value of $215 million. Natural gas was imported under a bilateral agreement between Argentina and Bolivia, due to expire in 1992.

Of the total production of natural gas during the year, 16% was used by home consumers, 15% in thermoelectric plants, 32% in industrial plants (including petrochemical plants), 4% was consumed at the production site, 14% was flared or vented, 8% was reinjected into the reservoirs for repressuring, and 11% represented losses. Proven recoverable resources of natural gas now stand at 700 billion cubic meters (24.7 trillion cubic feet), most of which is in the Neuquén Basin. The most important project underway during the year was the construction of the NEUBA II natural gas pipeline, which, together with the extension to the northern gas pipeline, was scheduled to start operating in 1989. Construction of this gas pipeline, per agreement signed in early February, will enable delivery of natural gas from Loma de La Lata and other nearby gasfields in Neuquén Province at a flow rate of up to 918 million cubic feet per day. The NEUBA II pipeline will run through the Provinces of Neuquén, Río Negro, La Pampa, and Buenos Aires to the federal capital and will consist of 667,000 meters of 36-inch-diameter pipe, 686,000 meters of 30-inch-diameter pipe, and 4,700 meters of 24-inch-diameter pipe, for a total length of 1,358 kilometers. Pipeline construction was by a joint venture of the Argentine group TECHINT and the Mexican firm PROTEXA, for a total cost of approximately $460 million.

Expansion of the northern gas pipeline will increase its delivery capacity by 42%, from 360 to 512 million cubic feet per day. Investment costs are estimated at $200 million, of which the International Development Bank will contribute $60 million for the acquisition of equipment and imported steel plate for the local pipe manufacture.

The Progas consortium, composed of Sofregas (France), Montreal Engenharia (Brazil), and Ecofisa-Calix (Argentina), presented to the Secretariat of Energy a gas recovery project estimated to cost $290 million. The project included the provision of equipment as well as the construction and installation of facilities in Neuquén, which would allow the extraction of the richest fraction of the natural gas delivered by existing gas pipelines, to be mixed with the natural gas delivered by the Neuquén-Bahía Blanca-Buenos Aires gas pipeline currently under construction. The Neuba gas enriched in this manner would be reprocessed at Bahía Blanca, where the richest fractions would be extracted.

At the third meeting of Governors from the northern provinces, construction of a gas pipeline from Salta Province to the northeastern provinces of the country and into Brazil was proposed. The project was expected to earn $1.2 billion yearly from the exploitation of gas reserves in the northern fields. These fields have estimated reserves of 140 million cubic meters (4.9 billion cubic feet). The provincial Governors pledged technical and financial support for this regional project.

Petroleum.—Crude oil production increased 5.2% compared with that of 1987 reversing the recent downtrend. Argentina, an exporter of crude oil and oil products from 1981 to 1986, became an importer again in 1987 requiring $260 million in foreign exchange. In 1988, however, the situation was beginning to reverse because the country required $84 million for imports. In 1988, there were limited exports of crude oil and oil products. Argentina's energy sector remained dominated by the state-owned Yacimientos Petrolíferos Fiscales (YPF). YPF contracts 32% of national oil production to the private sector while accounting for 66% of the total; the remainder is produced by concessions. Nationalistic forces have fought to keep the dominant part of petroleum production as a state-controlled operation claiming that petroleum resources are a vital part of the national patrimony. At the same time, the Government's inability to adequately develop petroleum resources to meet domestic demand have resulted in costly oil imports. Therefore, the Government has turned increasingly to the private sector to boost the country's petroleum production. In 1985, the Government developed the Houston Plan, designed to attract private investment for high-risk areas. To date, three international tenders have been issued under the Houston Plan, and a fourth was to be launched later in 1989. In 1987, in response to the continued fall in production levels, the Government developed the Olivos Plan to provide higher price incentives for private operators under concessions. The Olivos Plan was not implemented until May 1988. At yearend, the Government was planning another production plan, the Petroplan, for 1989, which was designed to attract private capital into areas previously reserved for YPF.

Uranium.—Production of yellowcake (U_3O_8) increased 38% to an estimated 155 tons compared with that of 1987. Approximately 25% of the total was produced from two private operations, the largest of which was the Los Gigantes deposit in Córdoba Province. The rest was produced from several deposits operated by the Atomic Energy Commission (CNEA). A feasibility study was completed in 1988 to activate the Sierra Pintada deposit in San Rafael, Mendoza Province. During 1988, exploratory work was carried out in the Provinces of Córdoba and Salta.

Argentina continued efforts to market its nuclear technology to developing nations. In December, the Government inaugurated a nuclear power reactor in Huarangal, Perú, 38 kilometers from Lima. The 10-megawatt reactor, built by the CNEA, was estimated to cost $110 million. The reactor uses 20% enriched uranium, and is designed for the production of radioisotopes for export to the South American market. As part of the 1984 bilateral nuclear cooperation agreement with Algeria, a contract was signed in May 1985 for Argentina to construct a 1-megawatt research reactor to be called NUR (Ar-

abic for brightness) in Dradi, 10 kilometers from Algiers. Construction began in 1987, and installation of the reactor was scheduled for the summer of 1988. The NUR reactor will use 20% enriched uranium shipped from Argentina. Argentina provided on-site technicians to supervise the construction, and trained Algerian technicians in Bariloche, Argentina. To keep the export program alive, the Government was considering future agreements with Iran, India, Saudi Arabia, Egypt, Syria, Turkey, Romania, Albania, and the U.S.S.R.

CHILE[4]

Introduction

Chile retained its dominant role as the leading producer and exporter of copper, accounting for 22% of the output of the market economy copper countries. Chile is also the world's largest producer and exporter of potassium and sodium nitrate. Chile ranked second in world output of iodine, lithium, molybdenum, and rhenium; fifth in boron; seventh in selenium; eighth in silver; and ninth in gold. In addition, Chile possesses approximately 23% of the world's copper reserves, as well as important reserves of lithium, 58%; rhenium, 40%; iodine, 23%; selenium, 21%; and molybdenum, 20%. Chile's production of copper reached a new historical level in 1988. The mining sector's contribution to the total export value was $4.1 billion[5] or 58% of the total. Corporación Nacional del Cobre de Chile (CODELCO-Chile) is the largest copper producer in the world, contributing about 74% of the total Chilean copper output and about 14% of the Western World's needs. Despite the various problems that beset CODELCO-Chile, 1988 was a profitable year for the company. The net profit of $587 million represented an increase of $320.2 million over that of the previous year. CODELCO-Chile contributed $1.5 billion to the Chilean Treasury in terms of profit sharing and taxes, compared with almost $600 million in 1987. A significant part of the higher profit was attributed to the substantial increase of the price of copper. The average copper price on the London Metal Exchange was $1.18 per pound, almost 37% higher than the average price in 1987.

Preliminary data of the Central Bank of Chile indicated the GDP grew 7.4%, to just above $22.1 billion. In terms of current dollars, this was the second highest rise in the GDP in Latin America. After a slight growth in 1987, output in the mining sector grew 4.2% in 1988, compared with 7.4% for the economy as a whole. This slower growth rate was due to production problems in CODELCO-Chile.

Government Policies and Programs

Most of the legal provisions concerning mining activities in Chile have been developed since 1980 and are still relatively new. The use of chapter 19 debt-to-equity swaps for foreign investment in the mining sector had been growing during the past 2 years and was expected to increase in 1989. However, the availability of the chapter 19 debt-to-equity swap program after March 1990 will depend on political developments. The chapter 19 provisions in Chile's foreign exchange regulations were instituted by the Central Bank of Chile as a mechanism for reducing the country's external debt.

Several large foreign mining companies have used or were planning to use chapter 19 provisions to finance specific portions of their large projects. Utah International Inc. used it to finance a small part of its $200 to $250 million Cía. Minera Salar de Atacama's (MINSAL) potassium chloride, potassium sulfate, boric acid, and lithium carbonate project. There were indications that chapter 19 may also be used in the development of Empresa Nacional de Minería (ENAMI) Quebrada Blanca gold project and the expansion of Placer Dome Inc. of Canada's La Coipa gold project. Although chapter 19 is not the most attractive mechanism for most large mining projects, it is an attractive alternative for specific non-profit-generating portions of the same projects. This is because chapter 19 debt-to-equity regulations require a 10-year waiting period prior to repatriation of capital. A 4-year waiting period is required for the repatriation of profits in percentages that do not exceed 25% of the original investment in any year.

Foreign banks have a strong incentive to use chapter 19 to diversify their portfolios by using the debt swap mechanism. The recent rise in precious and base metals and iodine prices in the world markets has caused mining projects to be among the most attractive investment opportunities in Chile. The use of chapter 19 has given great support to the development of mining activity in Chile, primarily in allowing medium-size investments to be made in high-potential deposits. Since 1985, approximately $100 million has been invested according to chapter 19 regulations specifically in the mining sector, which corresponds to more than 7% of the total chapter 19 investments in all sectors of the economy.

According to Chile's Foreign Investment Committee, total authorized investment rose to $1.95 billion, compared with $563 million in 1987. Mining was the sector that attracted the largest investment with $1.33 billion; followed by services, $490 million; and industry, $91 million.

Actual investment rose to $787 million, compared to $497 million in 1987. Of this total investment, $358 million went to the mining sector, $323 million to services, and $102 million to industry.

Production

The 16 leading minerals produced in Chile were coal, copper, gold, iodine, iron ore, lead, lithium carbonate, man-

ganese, molybdenum, sodium and potassium nitrates, natural gas, crude oil, petroleum products, silver, sodium sulfate, and zinc. Output of 5 of these minerals decreased while production for the other 11 increased. The production of fine copper increased 4.2% to 1.47 million tons, a record high. Molybdenum, doré metal, and sulfuric acid were produced as byproducts of copper. CODELCO-Chile accounted for 74% of the country's total copper output and all of the output of molybdenum. The small- and medium-size mining sector produced the remaining 26% of the copper.

Trade

Mineral exports accounted for 58% of Chile's total exports, followed by the industrial sector with 30% and the agricultural sector with 12%. The latest figures from the Central Bank of Chile reveal that the nation's total mineral export earnings were up 49%, to $4.1 billion, mainly due to a bullish copper market. Copper exports were valued at $3.4 billion, up almost 61% accounting for 82% of the total minerals exported. Increases in export value of other commodities were as follows: Nitrates and iodine, 23%; gold, 14.4%; iron ore and pellets, 8.7%; molybdenum, 8%; silver, 3%; and other minerals, 12%. Of the copper exported, 59% was electrolytic copper in the form of wire bars and cathodes, 15% was fire-refined copper, 15% was blister copper, and the remaining 11% was copper contained in concentrates. Of the total copper exported, 1.1 million tons was produced and shipped by CODELCO-Chile, and the remainder was sold by private companies. Earnings by CODELCO-Chile from copper exports totaled $2.9 billion, about $983 million more than in 1987. CODELCO-Chile's shipments of molybdenum amounted to about 16,300 tons of contained molybdenum for a value of about $148 million. Shipments by CODELCO-Chile of other byproducts included doré metal and rhenium.

Commodity Review

Metals.—**Copper.**—Chile continued as the leading producer and exporter of copper in the world, and contributed 82% of the value of mineral exports. Most of the increase in Chile's export revenue can be attributed to a 61% rise in copper prices. The f.o.b. value of the copper exports was approximately $3.4 billion, a 61% increase compared with that of 1987. CODELCO-Chile, the largest copper producer in the world, produced 74% of the total national output. The small- and medium-size mining sectors, which produced 24% and 2%, respectively, accounted for the rest of the output. The output of 1.1 million tons of fine copper attained by CODELCO-Chile was slightly larger than the level achieved in 1987. In addition, CODELCO-Chile produced 63,802 tons of copper cathodes through custom electrolytic refining. In all, 98.2 million tons of sulfide and oxide ores was processed during the year. CODELCO began the year with a production target of 1.2 million tons, a figure that was ultimately reduced to 1.1 million tons. The reduction was due to a number of factors including rock bursts in one of the operating levels of the El Teniente Mine in December 1987, rapidly declining ore grades in the El Salvador Div., a fire in the Andina Div., and the startup problems and a subsequent explosion in the new flash oven at the Chuquicamata Div.

ENAMI, Chile's national mining company, produced 109,000 tons of copper, a decrease of 4.5%. This decrease was caused by fewer deliveries and declining ore grades from Chile's small- and medium-size mining companies. Minera Disputada de las Condes S.A. (a subsidiary of Exxon Minerals Chile Inc.) increased its production to 125,100 tons of copper during its first full year of production from its recently expanded El Soldado Mine.

Because of declining copper ore grades, Anglo-American Corp.'s Empressa Minera de Mantos Blanco's production declined to 79,000 tons, and the Sociedad Minera Pudahuel S.A.'s production declined to 13,000 tons. Chile's gold producers, principally Bond International Gold's Compañia Minera El Indio, increased production to 30,100 tons from a heap-leaching process of lower grade ores.

There was considerable activity in exploration and evaluation of major investments in large copper mines. The best known is the La Escondida copper project, which was well advanced and expected to add 320,000 tons per year to Chile's copper production. By 1993–94, when CODELCO-Chile's expansion projects come on-stream, Chile's copper production is estimated to reach 2.8 million tons per year. Phelps Dodge Corp. (Ojos del Salado Mine) and Exxon (Los Bronces Mine) are studying expansion methods to increase production at their mines to 90,000 tons each. Cerro Colorado, a property that was found to be marginal as a flotation beneficiation project, has been revived by Río Algom Ltd. of Canada as a possible bacterial leach operation to produce 40,000 tons per year of copper cathodes. Los Pelambres, owned by the LUKSIC Group, was being evaluated for application of an electrowining process at a 40,000-ton-per-year level. Both of these leach projects have a competitive advantage over other locations in the world because of the large surplus of sulfuric acid generated in Chile by the pollution-control programs. The LUKSIC Group, owned by the Chilean-Yugoslav LUKSIC Group through Dolberg Finance Corp., is the largest of the domestic operations in Chile, with copper production of about 30,000 tons per year. The group has controlling interest in Cía. Minera Carolina de Michilla, Anaconda South America Inc., and Cía. Minera Cerro Centinela S.A. The latter, an operating company, holds controlling interest in Cía. Minera Cerro Negro, Santa Margarita de Astillas, Combarbalá, and Illapel Mines.

TABLE 4

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[p]
METALS						
Arsenic trioxide[e]		3,500	4,000	4,000	r3,616	p3,207
Copper:						
Mine output, Cu content[4]		1,307,503	1,359,840	1,395,781	1,412,936	1,472,041
Metal:						
Smelter, primary[5]		1,098,300	r1,088,400	1,123,900	1,106,900	1,189,400
Refined:[6]						
Fire, primary refined[e]		183,000	180,900	r185,100	r180,300	p200,902
Electrolytic[e]		696,700	703,400	757,200	r790,000	p811,898
Total		**879,700**	**884,300**	**942,300**	**970,300**	**1,012,800**
Gold, mine output, Au content	troy ounces	541,064	554,278	576,719	547,678	662,755
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	6,685	6,534	6,981	6,690	7,866
Fe content[e]	do.	3,991	3,967	r4,197	4,078	4,801
Metal:						
Pig iron	do.	594	580	591	617	776
Ferroalloys:						
Ferromanganese		4,890	6,330	6,277	6,614	6,899
Ferrosilicomanganese		—	755	1,706	1,232	681
Ferrosilicon		6,365	4,501	3,732	4,258	5,685
Ferromolybdenum		2,211	671	1,397	885	1,190
Other		—	—	247	502	2,211
Total		**13,466**	**12,257**	**13,359**	**13,491**	**16,666**
Steel, crude[7]	thousand tons	692	689	706	726	899
Semimanufactures (hot-rolled)	do.	473	442	481	502	659
Lead, mine output, Pb content		4,284	2,473	1,501	829	1,359
Manganese ore and concentrate:						
Gross weight		26,807	35,631	31,631	31,803	43,655
Mn content		8,680	11,865	11,097	10,821	14,511
Molybdenum, mine output, Mo content		16,861	18,389	16,581	16,941	15,527
Rhenium, mine output, Re content	pounds	14,198	12,266	18,609	14,471	p15,300
Selenium	kilograms	25,450	50,037	47,000	45,909	44,051
Silver	thousand troy ounces	15,766	16,633	16,078	16,068	16,284
Zinc, mine output, Zn content		19,168	22,288	10,504	19,618	19,182
INDUSTRIAL MINERALS						
Barite		21,722	54,494	53,121	52,109	43,135
Borates, crude, natural (ulexite)		3,985	4,773	6,440	13,438	32,122
Cement, hydraulic	thousand tons	r1,400	r1,424	1,434	1,594	1,833
Calcite	do.	—	—	2,757	2,972	2,900

See footnotes at end of table.

TABLE 4—Continued

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[p]
Clays:						
Kaolin		42,608	48,537	42,170	44,533	54,129
Other (unspecified)		18,543	9,177	14,215	15,975	21,067
Diatomite		1,712	2,317	2,684	3,218	2,919
Feldspar		3,026	2,565	2,275	705	4,453
Gypsum:						
Crude		167,477	195,911	192,848	235,173	315,798
Calcined		44,818	57,222	60,452	92,441	92,135
Iodine, elemental		2,661	3,020	3,076	3,115	4,035
Lapis lazuli	kilograms	9,000	8,500	"8,000	—	—
Lime, hydraulic[3]	thousand tons	778	800	800	750	750
Lithium carbonate		2,110	4,508	4,458	6,139	7,332
Nitrogen: Natural crude nitrates:						
Sodium		595,360	621,330	617,010	556,240	546,560
Potassium		132,100	150,000	147,100	165,070	181,020
Total		**727,460**	**771,330**	**764,110**	**721,310**	**727,580**
Phosphates:						
Guano		NA	3,150	7,546	5,605	4,052
Rock		4606	7,110	6,684	10,389	9,161
Total		**4,606**	**10,260**	**14,230**	**15,994**	**13,213**
Pigments, mineral, natural, iron oxide		16,113	8,224	4,404	8,145	8,542
Potash, K_2O equivalent		18,494	21,000	20,000	23,110	25,343
Pumice (includes pozzolan)		172,150	206,333	222,080	242,453	277,179
Quartz, common		293,465	267,510	293,218	350,488	420,797
Salt, all types		625,760	753,427	1,032,373	865,168	1,042,466
Sodium compounds, n.e.s.: Sulfate[4]		56,770	52,700	58,700	60,406	79,079
Stone:						
Limestone	thousand tons	2,326	2,470	2,757	3,017	3,647
Marble		1,440	1,300	NA	NA	1,152
Sulfur:						
Native, other than Frasch:						
Refined		13,685	14,755	13,297	14,917	16,924
Caliche		40,279	63,992	43,826	22,131	20,725
Byproduct, (from smelters and oil refining)		32,135	30,073	41,142	335,116	416,266
Total		**86,099**	**108,820**	**98,265**	**372,164**	**453,915**
Talc		422	1,299	2,257	980	1,070
MINERAL FUELS AND RELATED MATERIALS						
Coal, bituminous and lignite	thousand tons	1,323	1,384	1,454	1,750	2,122
Coke, Coke-oven	do.	278	291	294	297	287
Gas, natural:						
Gross	million cubic feet	172,971	163,790	153,866	153,709	151,110
Marketed	do.	53,431	50,535	42,342	37,215	42,631

See footnotes at end of table.

TABLE 4—Continued

CHILE: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[p]
MINERAL FUELS AND RELATED MATERIALS—Continued						
Natural gas liquids:						
Natural gasoline	thousand 42-gallon barrels	962	945	893	898	893
Liquefied petroleum gas	do.	2,956	2,916	2,716	2,767	2,662
Total	**do.**	**3,918**	**3,861**	**3,609**	**3,665**	**3,555**
Petroleum:						
Crude	do.	14,069	13,048	12,204	10,922	8,934
Refinery products:						
Gasoline:						
Aviation	do.	56	25	82	50	53
Motor	do.	8,233	8,246	7,793	9,438	10,374
Jet fuel	do.	1,264	1,195	1,372	1,632	1,659
Kerosene	do.	855	755	969	1,323	1,439
Distillate fuel oil	do.	8,064	8,749	9,661	11,653	13,154
Residual fuel oil	do.	5,982	5,566	5,642	5,983	6,595
Liquefied petroleum gas	do.	5,114	4,831	5,044	5,335	5,878
Unspecified	do.	1,453	1,554	1,566	1,185	1,394
Total	**do.**	**31,021**	**30,921**	**32,129**	**36,559**	**40,546**

[e] Estimated. [p] Preliminary. [r] Revised. NA Not available.

[1] Table includes data available through Aug. 1989.

[2] In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Figures are the nonduplicate copper content of ore, concentrates, cemented copper, slags and minerals, copper as a byproduct of gold and silver precipitate, and other copper-bearing products measured at the last stage of processing as reported in available sources.

[5] Figures are total blister, fire-refined, electrolytic, and equivalent copper output including that blister subsequently refined in Chile and copper produced by electrowinning. Detailed statistics on electrowinning are not available, although based on current plant capacities, electrowon copper production is estimated to be approximately 55 metric tons per year.

[6] Figures are total refined copper distributed into two classes according to method of refining: fire-refined and electrolytic, which includes electrowon copper refined in Chile.

[7] Excludes castings.

[8] Includes natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry.

Gold and Silver.—Chile's Servicio Nacional de Geologia y Mineria reported that gold production increased 21% to 663,000 troy ounces, and silver production increased 1.4% to 16.3 million ounces.

Gold was produced by several small, medium, and large lode and placer mines and as a byproduct of metallic copper, silver, lead, and zinc mines. The small- and medium-size gold mines produced 73% of the total production, followed by the copper mines with 23%, and the silver, lead, and zinc mines with the remainder. The largest gold-producing companies were Minera El Indio, Cía. Minera El Bronce de Petorca, Sociedad Contractual Minera Vilacollo, and the Homestake Mining Co.

Minera El Indio was recently acquired from St. Joe Gold Corp. by Bond international Gold of the Cayman Islands, a subsidiary of the Bond Corp. of Australia. Minera El Indio operates an open pit and an underground mine at El Indio, and an open pit heap-leach operation at El Tambo, 8 kilometers southeast of El Indio. In addition to the $24 million expansion of its concentration plant, the company invested $12 million in a second concentrate toaster and $4.5 million in a pressure tailings filtering plant to recover scarce processed water. The company is investing $24 million in the expansion of both mines and $6 million in exploration in the surrounding area. The company produced 209,000 ounces of gold, 1.13 million ounces of silver, and 20,000 tons of copper. The company also produces arsenic trioxide. According to the company, total reserves are in excess of 10 million tons. The second largest gold producer, Minera El Bronce de Petorca operates the El Bronce Mine at Petorca in the north of Santiago Province. Production aver-

ages 113,000 ounces of gold, 96,000 ounces of silver, and about 1,250 tons of copper per year. The next most important gold and silver producer in Chile is CODELCO-Chile. ENAMI, a major purchaser of gold concentrates and ores, smelted 225,000 ounces of gold bars in 1988. Two recently expanded projects are the Choquelimpie gold-silver mine purchased in August from Cía. C.P.A. PROMEL by Minera Vilacollo (owned by Citibank-Chile, Shell Chile, and Westfield Minerals of Canada) and the El Hueso open pit gold operation, which Minera Homestake Chile leased from CODELCO-Chile.

The most promising new gold-silver projects are La Coipa and Marte. ENAMI and Consolidated TVX of Canada purchased La Coipa for $58 million in July 1987. La Coipa was purchased from Cía. Sierra Morena (a subsidiary of Consolidated Goldfields of the United Kingdom), Banco Nacional, Banco Concepción, and a number of individuals. The La Coipa Norte Mine, with a potential third stage, is still being explored. The principal advantages of the project include low-cost open pit mining, an agitation leaching method, high-grade ores, and the flexibility of development. Proven ore reserves contain 60 tons of gold and 7,500 tons of silver. Given the size of these reserves, the La Coipa project has the potential of becoming one of Latin America's richest gold and silver deposits. There are also a large number of companies developing other gold mines that could increase production in the near future. These companies include ENAMI, Minera Anglo-American Chile, Cominor, Anaconda Chile, Minera LAC Chile S.A., Chevron Minera Corp., Inversiones Mineras del Inca, Cía. Minera Horus, Freeport Chile Exploration Co., Cía. Minera Millantum de Traiguen, Cía. Minera Doña Inez, and Falconbridge Chile S.A.

The presence in Chile of Canadian mining companies is growing every year. Placer Dome Inc. was the fifth

TABLE 5

CHILE: EXPORTS OF COPPER AND MOLYBDENUM ORE, BY DESTINATION[1]

Destination	Copper (thousand metric tons)			Molybdenum (metric tons)
	Ore and concentrate, Cu content[2]	Blister	Refined	Ore and concentrate, Mo content
1987				
Argentina	—	—	50.5	—
Belgium-Luxembourg	—	—	—	608
Brazil	77.7	13.1	81.6	—
Canada	19.8	—	—	—
China	—	8.9	18.2	—
Finland	8.6	—	—	—
France	—	—	90.8	—
German Democratic Republic	—	5	7.5	—
Germany, Federal Republic of	2.5	23.6	105.3	—
Greece	—	—	13.8	—
Hungary	—	6.9	—	—
Indonesia	—	—	16.7	—
Italy	(3)	7.9	122.3	—
Japan	84.2	—	94.0	—
Korea, Republic of	27.3	—	48.0	—
Malaysia	—	—	11.5	—
Netherlands	(3)	1.5	4.3	1,041
Portugal	—	—	6.2	—
Saudi Arabia	—	—	4.0	—
Spain	41.3	—	5.4	—
Sweden	5.3	—	9.4	309
Taiwan	5.6	—	53.2	—
Turkey	—	14.9	2	—
United Kingdom	—	17.0	31.3	—
United States	1	31.7	150.6	—
Venezuela	—	—	9.4	—
Yugoslavia	—	11.3	3.5	—
Other	.1	2.6	4.9	—
Total	**272.5**	**139.9**	**942.6**	**[4]1,957**
1988				
Argentina	—	—	32.4	—
Belgium-Luxembourg	(3)	14.7	6.0	—
Brazil	65.5	14.1	24.8	—
Canada	5.8	—	—	—
China	4.1	3.0	16.8	—
Finland	16.9	—	—	—
France	—	1.6	120.5	—
German Democratic Republic	—	—	6.0	—

See footnotes at end of table.

TABLE 5—Continued

CHILE: EXPORTS OF COPPER AND MOLYBDENUM ORE, BY DESTINATION[1]

Destination	Copper (thousand metric tons)			Molybdenum (metric tons)
	Ore and concentrate, Cu content[2]	Blister	Refined	Ore and concentrate, Mo content
1988—Continued				
Germany, Federal Republic of	8.3	18.7	142.7	—
Greece	—	—	9.8	—
Hungary	—	1.5	3.0	—
Indonesia	—	—	11.0	—
Italy	—	3.0	145.7	—
Japan	52.4	1.0	111.5	—
Korea, Republic of	16.8	3.0	41.1	—
Malaysia	—	—	8.9	—
Netherlands	—	3.0	12.9	782
Portugal	3	—	6.6	—
Saudi Arabia	—	—	4.0	—
Spain	31.1	—	4.3	—
Sweden	1.6	—	15.8	—
Taiwan	3.0	—	66.7	—
Turkey	—	11.3	—	—
United Kingdom	1.0	10.4	50.4	239
United States	10.8	63.8	106.9	—
Venezuela	—	—	15.0	—
Yugoslavia	3.9	11.7	5.0	—
Other	4.5	3.2	7.6	—
Total	**226.0**	**164.0**	**975.4**	**1,021**

[1]Table prepared by H. D. Wills.
[2]Includes cement copper and secondary copper.
[3]Less than 50 tons.
[4]Data do not add to total shown because of independent rounding.

Source: Estadísticas del Cobre, 1987 and 1988 monthly editions, Comision Chilena del Cobre.

Canadian mining company to establish operations in Chile during the past 2 years. In December, Placer Dome acquired 51% of La Coipa and formed a new operating company, Cía. Minera Mantos de Oro. This firm plans to invest $190 million to develop the Ladera-Farellón open pit as a second stage of this project. The Farellón open pit mine, a large low-grade operation, was planned for startup in 1991. Ore processing capacity was expected to be 15,000 tons per day with production of 8 tons of gold per year for 10 years.

Anglo-American Chile, a consortium of Anglo-American, Cominco Resources International Ltd. of Canada, and the Chemical Bank of New York, is developing the Marte project. The group has invested $30 million in exploration and in the construction of 429 kilometers of roads. It is planning an additional $47 million to develop an open pit mine by March 1989. In October, Glamis Gold Ltd. of Canada purchased 51% of the San Cristobal gold deposit from Inversiones Mineras del Inca S.A. for $3 million, with an option on the remaining 49% for $6 million.

Echo Bay Mines Ltd. of Canada acquired 100% of Minera Orión Chile Ltd. from Tenneco in late 1986, one-half of which was later transferred to Coeur d' Alene Mines of the United States. In August 1987, LAC Minerals Ltd. of Canada purchased 85% of the bankrupt Sociedad Contractual Minera El Toqui Ltda. (SCMT) and expanded the SCMT zinc mine in the 11th region in the south of Chile. In December 1987, LAC signed an option to purchase 85% of the group Cía. Minera Anita Apolinario gold mine in the fourth region and an option to purchase 85% of the Huantajalla silver mine in the first region. Cominco was participating in joint ventures with Anglo-American Chile to develop the Marte and El Lobo gold projects in the third region. It also purchased 25% of the equity of Minera de Mantos Blancos, which operated the Mantos Blancos copper project in the second region.

Falconbridge Chile, a subsidiary of Falconbridge Ltd. of Canada, owns a small portion of Minera de Mantos Blancos. Falconbridge also recently purchased Mobil Oil Corp.'s 80% interest in the Collahuasi copper project in the first region and now owns 100% of the project. Glamis Gold Ltd. purchased 51% of the Inversiones Mineras del Inca S.A. and the San Cristobal gold project in the second region. The Rayrock Mining Co. is developing the Ivan copper project in the second region. Finally, Río Algom Ltd. of Canada, a subsidiary of Río Tinto Zinc Corp. Ltd. of the United Kingdom, is reevaluating the Cerro Colorado copper project in the first region. As a result of these activities, Canada will soon have the third largest foreign mining presence in Chile, after the United States and Australia.

There were a large number of new silver projects that were expected to raise Chile's silver production to over 27.3 million ounces per year in the near term. Currently CODELCO-Chile and

other large copper producers provide nearly 70% of all the silver produced. ENAMI smelted 8 million ounces of silver in 1988. The two largest independent silver producers were Procesadora de Metales Ltda. and PROMEL, with two plants. The PROMEL plant near the Peruvian border has a leach capacity of 680 tons per day while the Pucara plant has an 1,800-ton-per-day-capacity. Both are supplied with ore from Choquelimpie Mine. The second producer, Compañía Minera Flomax S.A. near Chuquicamata, operated a 200-ton-per-day heap-leaching facility, supplied with ores from the old Caracoles Mine waste dumps, producing about 480,000 ounces of silver per year. PROMEL sold its Choquelimpie Mine to the Shell consortium, which is now focused on the gold values in the deposit instead of silver.

Iron Ore.—Production of iron ore increased almost 18% to nearly 8 million tons. Cía. Minera del Pacífico S.A. (CMP), a subsidiary of the Cía. de Acero del Pacífico S.A. de Inversiones (CAP), operated three iron ore mines in the northern part of the country: El Romeral and El Algarrobo in the third region and El Laco in the second. The El Algarrobo Mine supplies 4.2 million tons annually of concentrate with 59% to 60% iron content to the Huasco pellet plant at Huasco Valley in La Serena. The plant has been expanded to a capacity of 4.5 million tons per year of self-fluxing pellets. The El Laco Mine in the mountains in the Atacama Province has been reopened to supply a high-grade (low-sulfur) ore to the Zapla steel plant in Jujuy, Argentina. Because of the altitude, the mine only operates in the summer. Production of iron ore pellets reached 4.2 million tons in 1988. Exports were 3 million tons of ore at $10.66 per ton and 3.6 million tons of pellets at $21.39 per ton.

CMP succeeded in opening up Australia as another market for its output. CMP's El Romeral Mine in Coquimbo will supply 68,000 tons of iron ore to The Broken Hill Pty. Co. Ltd.'s New South Wales plant. It was hailed as something of a coup for the Chilean company, since Australia is one of the leading iron ore exporters in the world. The first shipments were scheduled for early Januauy 1989 under a contract worth $1 million. CMP has opened several other new markets for its products, in China, Qatar, the Republic of Korea, and Yugoslavia in addition to sales to Australia and Argentina. According to company sources, the most important market penetration was the sale to China, which could establish the beginning of a long and prosperous business relationship. The first shipment of 55,000 tons of iron ore to China was worth $1.3 million.

Iron and Steel.—Production of ferroalloys, pig iron, and crude steel increased 24%, 26%, and 24%, respectively; semimanufactured (hot-rolled) products increased 38% in response to increased domestic and international demand. The country was practically self-sufficient in steel, importing a small amount from Brazil. A small percentage of the country's steel production was exported in the form of steel pipes for the U.S. petroleum industry. More than 95% of Chilean steel is produced by the Cía. Siderúrgica de Huachipato (CSH), a subsidiary of CAP. The remainder is produced by three small companies. In keeping with increased production plans, CSH has embarked on an ambitious expansion plan to increase its ingot production to 850,000 tons per year. A 500,000-ton coke plant, under construction in Talcahuano Province, should be completed by the second half of 1990. The new plant, aimed at increasing ingot production, will increase consumption of domestic coal by 300,000 tons per year. A continuous casting line and rolling mill purchased in 1975 were to be installed as part of the project. The company plans to modernize and expand the hot and cold bar rolling mills.

Lead and Zinc.—Chile's lead and zinc production increased 64% and declined 2%, respectively. Chile's three traditional zinc and lead producers include the SCMT in the 11th region, the Compañía Minera Catemu Ltda. in the 5th region, and the Empresa Minera de Aysén Ltda. in the 11th region. SCMT's El Toqui Mine in Aysén Province, southern Chile, was the largest producer of lead and zinc. Under the new ownership of Minera LAC Chile S.A., a subsidiary of LAC Minerals of Canada established in December 1987, $19 million was invested under the Central Bank of Chile's chapter 19 debt-to-equity swap program to obtain $30 million worth of Chilean currency. Of this amount, the equivalent of $25 to $26 million was used to liquidate SCMT's outstanding debt. The remainder was used to purchase an 85% interest in SCMT and two affiliated gold mining companies, Sociedad Minera Katterfeld and Sociedad Minera Condor. Minera LAC Chile is 99% owned by LAC Minerals of Canada and 1% owned by LAC's U.S. subsidiary LAC Minerals Inc. Since December 1987, LAC of Canada has invested additional capital in the determination of additional ore reserves, the purchase of new mining equipment, the expansion of the capacity of the concentration plant, and the expansion of SCMT's hydroelectric powerplant.

SCMT produced approximately 32,000 tons of zinc concentrate with a value of approximately $8 to $9 million. SCMT expects to produce as much as 50,000 tons of zinc concentrate in 1989 after the expansion of the El Toqui concentration plant and the transfer of mining operations to the Mallín Alto deposit. In June 1989, Minera LAC Chile was scheduled to begin a prefeasibility study on the possibility of increasing production to 200,000 tons of zinc concentrate per year and the possible construction of a zinc refinery. Almost all of SCMT's zinc concentrate was sold c.i.f. to Brazil, where SCMT took advantage of

lower freight and insurance costs. SCMT's iron and silver concentrate was stored in Puerto Chacabuco, from where it will eventually be sold in public auction.

Manganese.—Manganese production increased 37% to almost 44,000 tons. All of Chile's manganese was produced by Manganesos de Atacama S.A. (MASA), a CAP subsidiary. MASA operated the Corral Quemado and Los Loros manganese mines in the fourth region and also leased other deposits in the same region. The company also produced ferromanganese, silicomanganese, and manganese dioxide at its ferroalloy plant in Coquimbo. CSH purchased all of MASA's manganese ore and the majority of its ferromanganese and silicomanganese. MASA produced 6,899 tons of ferromanganese and 681 tons of silicomanganese. MASA was developing a high-grade manganese ore deposit in the fourth region, which was believed to be an extension of the existing mines. Production should begin in 1989. The company plans to install a second ferroalloy plant at Coquimbo.

Vanadium.—CMP was studying the possibility of producing and exporting vanadium from CMP's El Romeral Mine where the iron ore has an average grade of 0.5% to 0.7% vanadium. According to CMP officials, the reserves of vanadium at El Romeral Mine represent about 6% of world reserves or 20% of the reserves of market economy countries. Three studies have been completed including a laboratory study, a pilot plant study, and an economic evaluation. An engineering study to optimize the proposed production process and determine the type of equipment to be used remained to be completed. Based on the studies already completed, the vanadium would be produced as a byproduct from the concentration of 1,500 tons of iron ore per day at the El Romeral Mine. The commercial products obtained from this process would include ammonium metavanadate and 98.5%-pure vanadium pentoxide with an estimated export value of $25 million per year.

***Industrial Minerals.*—Lithium and Potassium.**—Sociedad Chilena de Litio Ltda. (SCL), jointly owned by Foote Mineral Co. (55%) of the United States (a subsidiary of Cyprus Minerals) and CORFO (45%), produced 7,332 tons of lithium carbonate, an increase of 19% relative to 1987. Although the company was capable of increasing production, the output was intentionally limited to avoid depressing the world price. In June, CORFO sold 25% of SCL shares to Cyprus Minerals for $6.5 million, thereby increasing Cyprus ownership to 80%. In late 1988, CORFO planned to sell the remaining 20% of its equity to Cyprus Minerals for $7.5 million. SCL's Government-authorized monopoly for the production of lithium in Chile expired at yearend. SCL was in the process of completing a potassium chloride plant capable of producing at least 35,000 tons and possibly 45,000 tons per year of 95%-pure potassium chloride. The plant will utilize the large amounts of sylvite discarded at the solar evaporation ponds. According to an agreement signed with Sociedad Química y Minera de Chile S.A. (SOQUIMICH) in 1987, the plant's entire production will be sold to SOQUIMICH to replace imported potassium nitrate. The plant was expected to go into operation in July at an estimated cost of $3 million.

Although installed lithium production capacity exceeded the 1988 demand by over 40%, Sociedad Minera Salar de Atacama Ltda. (MINSAL), a consortium of AMAX Inc., 63.75%; CORFO, 25%; and Molibdenos y Metales S.A. (Molymet), 11.25%, was close to making a final decision to establish a competing potassium chloride, potassium sulfide, boric acid, and lithium carbonate production operation in an adjacent area of the Salar de Atacama. In another effort to avoid flooding the world market, CORFO has limited initial lithium production of the MINSAL project to 16,500 tons of lithium carbonate per year, but MINSAL will still be able to increase this amount by 7% per year during the life of the project.

Nitrates and Iodine.—Chile's iodine production increased by 30% to just over 4,000 tons, strengthening Chile's position as the world's second largest producer of iodine after Japan. Most of this increase was produced by SOQUIMICH, the recently privatized state nitrate company, which increased its production to 3,600 tons. The remainder was produced by the newly established Amsterdam Chemical Pharmaceutical Minera (APC Minera) a consortium of the Sociedad Contractual Minera Lagunas, the Amsterdam Pharmaceutical Co. (ACF) of the Netherlands, the Compañía de Salitre y Yodo de Chile (COSAYACH), and the Compañía Minera del Alba. Production of iodine has helped revitalize Chile's traditional nitrate industry. Iodine production in Chile is obtained as a by-product of nitrate production or as the primary product of a newly developed process to extract iodine from abandoned nitrate tailings in Chile's first and second regions. Increased byproduct output has been associated with a 13% increase in Chile's nitrate production.

Chile exported nitrates to 67 countries on 5 continents; iodine was exported primarily to Europe and the United States. Over 80% of the nitrate production was exported; the remainder was consumed in Chile's growing agricultural sector. Because of increased byproduct and primary iodine production, iodine has replaced nitrates as SOQUIMICH's largest source of operating income, increasing from close to zero in 1983 to a total of over $52 million in 1988. Although the increase in iodine production was the most important factor in this increase in income, other factors included higher prices for iodine and increased produc-

tion of potassium nitrate, which was more profitable than SOQUIMICH's sodium nitrate production.

SOQUIMICH was planning to invest $3.75 million in a joint venture with ISE Chemicals and the Mitsubishi Corp. of Japan. A 6-month feasibility study was underway, and the final decision was to be made before the end of 1989. Production was expected to begin in 1990 with a capacity of 500 tons of iodine per year. Further into the future, SOQUIMICH was also planning to invest $100 million in the Pissis, Nebraska, and Perdiz nitrate and iodine projects in the first region. The project was aimed at production rates of 300,000 tons of nitrate and 1,000 tons of iodine per year.

Sulfur.—Chile has been an importer and producer of sulfur for many years. In 1988, Chile imported over 70,000 tons of sulfur mostly from Canada.

Chile's native sulfur production derived from caliche decreased 6.4%. Chile also produced nearly 17,000 tons of refined sulfur, an increase of 13.5%. Chile's total production of sulfur, including sulfur derived from smelters and oil refineries, increased 22% in 1988.

Although imports and the production of refined sulfur has remained fairly constant over the past 5 years, the domestic production of caliche has been declining. This is because the caliche once purchased by CODELCO-Chile's Chuquicamata Div. for the production of sulfuric acid is gradually being replaced by the sulfuric acid produced by the Chuguicamata Div.'s new sulfuric acid plant.

Despite the decline in the domestic demand for sulfur, a number of foreign mining companies have expressed interest in the production of Chilean sulfur for export to the United States and other markets. Because of Chile's many volcanoes, it has over 100 identified sulfur prospects. All are at an altitude in excess of 4,000 meters, and all contain ores with 35% to 50% sulfur.

***Mineral Fuels.*—Coal.**—Coal output increased 21% to 2.1 million tons in 1988. The Chilean Government has encouraged greater domestic coal production as a means of reducing Chile's dependence upon imported petroleum. This effort resulted in the opening of the Cía. de Carbones de Chile S.A. COCAR Pecket coal mine in region 12 and COCAR's signing of a 10-year contract to supply coal to CODELCO's Tocopilla electric power division in the second region. Coal provides almost 70% of the electricity for Chile's Northern Electric Power Grid, which supplies the first and second regions. Coal production, however, has not kept up with demand. It was estimated that Chile may have to import 500,000 tons of steam coal per year for at least the next 3 years. Coal production costs at the Pecket Mine were estimated by Chile's Power Institute to be about $26 per ton, compared with $60 per ton for underground coal produced by Empresa Nacional del Carbón S.A. (ENACAR) in the Concepción area.

COCAR's bulk coal shipments to CODELCO-Chile in Tocopilla started in the last quarter of 1987. CODELCO-Chile's Chuquicamata Div. powerplant was converted from fuel oil to coal because of lower operating costs. ENACAR operates the Lota, Colico, Trongol, and Lebú underground coal mines in region eight and is Chile's largest coal producer. ENACAR is 98.9% owned by CORFO. ENACAR produced almost 791,000 tons of bituminous coal with a heating value ranging from 6,100 to 7,100 kilocalories.

Natural Gas.—Gross output of natural gas decreased slightly, continuing the declining trend since 1982. Of total production, 68% was reinjected; 4% was flared; and 28% was used in the field, lost during transmission, or marketed internally. Chile has been producing petroleum in the 12th region since 1945, but it has not been able to find a way to effectively use the associated natural gas.

In an effort to attract foreign investors for several gas-related projects, Chile called for international bids. Chile chose the Henley Group of the United States to develop a methanol project and Combustion Engineering of the United States to develop an ammonia urea project. Once these two projects are in place, the necessary raw material will be available for a variety of downstream projects based on hydrocarbons.

Natural gas was also used to provide heat and electricity for the principal cities of the 12th region. With the completion of the Cape Horn methanol plant in 1988, a greater percentage of the annual production of natural gas was being consumed than in previous years, thereby reducing the amount available for reinjection.

In March, state-owned Empresa Nacional del Petróleo (ENAP) completed the construction of 178 kilometers of an 18-inch natural gas pipeline between Posesión and Punta Arenas. The pipeline can transport 212 million cubic feet of gas per day to the methanol and ammonia-urea plants in Cabo Negro and the city of Punta Arenas. The total cost of the gas pipeline was $20 million.

Petroleum.—ENAP was Chile's only producer of crude oil and natural gas. ENAP reported that Chile's production of crude oil was about 8.9 million barrels, an 18% decrease from that of 1987. This continued the decline that started in 1983. Offshore production represented 63% of the annual total. Production wells on Tierra del Fuego Island accounted for almost 21%, while mainland production dropped sharply and, in 1988, supplied only 16% of the total. ENAP's production has declined from a peak of 54% of national consumption in 1982 to a 30% share in 1988. The declining trend in output of crude oil in the Magellan region prompted Chile's ENAP to extend its exploration efforts to other areas of the country. In 1988, a contract for a joint exploration project was signed with Hunt Oil Co. of the United

States. Similar negotiations have been initiated with Eurocan Ventures Ltd. of Canada, Shell Oil-Pecten International of the United States, and Maxus Energy of the United States, the former Shamrock Co. During the first quarter of 1989, ENAP and Hunt Oil Co. were scheduled to start a drilling operation in the Atacama salt flats in northern Chile, estimated to cost $10 million. Hunt is a majority partner with 65% interest in the project. Additionally, Hunt presented another proposal to the Government to join ENAP in exploring 5,000 square kilometers in the highlands of Parinacota in northern Chile.

Eurocan Bermuda Ltd., a subsidiary of Eurocan Ventures Ltd., was negotiating an agreement with ENAP to search for oil in a 5,000-square-kilometer area in the Pedernales and Maricunga salt flats. Pecten International has shown interest in exploring the Imilac salt flats and the San Pedro de Atacama area. Another firm interested in the area, Maxus Energy, was considering the Punta Negra salt flat zone. ENAP signed an agreement in April with PETRO-CANADA to jointly explore for oil in Ecuador.

PARAGUAY[6]

Introduction

Paraguay's economic performance continued improving, and the GDP grew by 4% compared with 4.3% in 1987 and negligible growth in 1986. The industrial sector also grew by 5.3% compared with 3.5% in 1987. The country's task is to become competitive by modernizing the industrial base and cutting costs. The Government expected to benefit from joining the regional economic integration efforts of Argentina, Brazil, and Uruguay. The existing legislation stipulates that export taxes be abolished and that a free fluctuating exchange rate be adopted for trade, services, and investment. Foreign debt is to be renegotiated and prices set according to the open market system.

Paraguay is predominantly an agricultural economy. Increased export revenues were derived from the sale of hydroelectric power to Argentina and Brazil. Mining made slow progress, although concessions and tax incentives encouraged national and foreign companies to undertake limited exploration.

Paraguay's mineral resources remained partially explored because of inadequate infrastructure, inflation, and limited private investment. Studies commissioned by the Dirección General de Recursos Minerales (DGRM) concluded that opportunities exist for the commercial development of marble, pyrophyllite, granite, talc, gypsum, and lignite.

Commodity Review

Metals.—Shortages of raw materials in the steel industry forced the 60% Government-owned, Aceros del Paraguay S.A. (Acepar), to produce at the 10% capacity of 150,000 tons per year of laminated steel products. The $290 million[7] Acepar plant at Villa Hayes, about 13 miles north of Asunción, is a joint venture of Paraguay and Brazil, and depends on iron ore and coal produced in Brazil. Discussions were held with the Bolivian Government to import 500,000 tons per year of iron ore from the Mutun Mine near the Paraguay border. The Mutun iron ore source is remote, but ore produced could be hauled by barge along the Paraguay River.

Industrial Minerals.—Industrial minerals such as limestone, gypsum, kaolin and other clays, glass sand, and stone were limitedly produced.

Paraguay's other mineral occurrences included soapstone, mica, pyrite, barites, copper in malachite and azurite, manganese in pyrolusite, and uranium. At yearend, reserves of lateritic iron ore on the Paraná River near Encarnación were estimated at 250 to 3,000 million tons with 35% iron.

The Government-owned Industria Nacional del Cemento (INC) operates two cement plants at Puerto Vallemí in Concepción and Itapucumi in Villeta, each having rated capacities of 400,000 tons per year and 600,000 tons per year, respectively.

Mineral Fuels and Energy.—Paraguay's total energy requirements continued to be heavily dependent upon oil and natural gas imports. Paraguay's Petróleos Paraguayos S.A. (Petropar) imported about 2.4 million barrels of crude oil from Algeria. The limited oil exploration in Paraguay was disappointing, although Piper Oil Co. delineated undetermined reserves of oil and natural gas in the Cuenca Curupayty District. Occidental Petroleum Co. of the United States identified an oil and natural gas bearing structure in Boquerón, Chaco Boreal of western Paraguay. Texaco Co. of the United States is to carry out geophysical surveys in a concession close to the border with Argentina, where substantial oil resources were discovered in 1984.

Paraguay's economy was expected to improve following the commissioning of additional 700-megawatt turbines at Itaipú hydroelectric plant on the Paraná River. When fully operational, the $18.5 billion Itaipú complex, a joint venture with Brazil, is expected to generate 12,600 megawatts, with revenues estimated to be at least $200 million per year.

The Yacyretá hydroelectric project, 200 miles downstream from Itaipú, a joint venture of Argentina and Paraguay, had been behind schedule because of Argentina's growing financial difficulties. The first group of turbines was not expected to be in operation until 1993. Yacyretá's installed capacity was expected to be 2,760 megawatts at a cost of about $5.6 billion.

TABLE 6

PARAGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Country and Commodity		1984	1985	1986	1987[p]	1988[e]
PARAGUAY[2]						
Cement, hydraulic	thousand metric tons	109	46	179	[r]261	[3]321
Clays:						
Kaolin		50,000	60,000	60,000	[r]72,000	76,000
Other	thousand metric tons	1,700	1,750	1,650	[r]1,898	1,910
Gypsum		6,000	2,500	2,800	[r]3,100	[3]3,600
Iron and steel:						
Pig iron		—	—	—	[r]33,500	[r]62,700
Steel, crude		—	—	—	[r]9,700	[r]62,300
Lime		85,000	80,270	88,290	92,500	96,000
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	327	506	672	646	650
Jet fuel	do.	18	115	162	160	150
Kerosene	do.	88	58	21	23	20
Distillate fuel oil	do.	512	623	640	656	650
Residual fuel oil	do.	149	223	254	200	200
Liquefied petroleum gas	do.	35	47	40	35	35
Refinery fuel and losses	do.	167	229	22	77	50
Total	**do.**	**1,296**	**1,801**	**1,811**	**1,797**	**1,755**
Pigments, mineral: Natural, ocher		250	260	250	285	250
Sand, including glass sand	thousand metric tons	1,654	1,741	1,659	1,893	1,900
Stone:						
Dimension	do.	62	65	65	60	60
Crushed and broken:						
Limestone (for cement and lime)	do.	175	180	387	507	500
Other	do.	1,730	1,850	1,720	1,990	2,000
Marble		300	400	450	600	750
Talc, soapstone, pyrophyllite		150	120	130	180	210

[e] Estimated. [p] Preliminary. [r] Revised.

[1] Includes data available through mid-June 1989.

[2] In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) undoubtedly were also produced, but output was not reported, and available information was inadequate to make reliable estimates of output levels.

[3] Reported figure.

[4] Data represent exports.

URUGUAY[8]

Introduction

Uruguay's economy continued in a period of slow growth, and the GDP reached almost 2% compared with 4% in 1987 and a robust growth of 6% in 1986. Uruguay remains a relatively free market economy, especially in trade, services, and investment, which are attractive to foreign investors.

Uruguay has limited mineral resources and a relatively undeveloped mineral industry. The country is endowed with small known reserves of gold, copper, lead, manganese, and zinc, mainly in Rivera, Soriano, Flores, and Colonia Departments; therefore, there was limited interest in mining investment, except for gold.

Commodity Review

Metals.—Low grade iron ore deposits are found at Valentines, in the southeastern part of Uruguay, with proven reserves of 45 million tons grading 40% iron, and at Zapucay, in the northern part of Uruguay, with 400 million tons grading 40% iron. The pending decision for a $140 million[9] iron and steel complex at Valentines, was not finalized at yearend.

Gold Standard Co. of Salt Lake City, Utah, signed a joint venture for exploring the San Juan Hills gold prospect with Compañía Minera San José, a 100% subsidiary of Bond International Gold Co. of the United States. Minera San José will be the project operator having 60% equity and being responsible for 100% of the exploration activity.

Industrial Minerals.—Uruguay's main quarrying activity continued on construction minerals such as dimension stone, limestone, dolomite, marble, and aggregates; however, lack of enough investment hampered the full potential of these industries. Lavalleja, an old dolomite deposit about 160 miles east of Montevideo, has a potential of 230,000 tons per year operation. Uruguay produced corundum as a natural abrasive, a commodity which has been largely replaced by synthetic abrasives. Corundum was used by glassmakers for grinding optical lenses; consumption remained volatile and in decline.

Mineral Fuels.—**Oil, Gas, and Energy.**—Uruguay is heavily dependent on imports of crude oil, and no known oilfields are existent. Natural gas reservoirs in the northwestern region of the country continued unexplored and the known coal deposits were considered subeconomic.

The 1988 drought affected the water levels in the Río Negro hydroelectric system and in the Uruguay River, which is the main water source for the Salto Grande Dam. The thermal plants were not able to meet the demand for electricity. The Uruguayan Government imposed rotating blackouts of 3 hours 1 day per week to balance electricity production and consumption.

The state-owned electric power agency, Administración Nacional de Usinas y Transmisiones Eléctricas (UTE), was overhauling its hydroelectric generating plant in Paso de los Toros, with World Bank financial assistance of $45.2 million. This first of four power dams was expected to be overhauled completely, during a 4-year program, at a cost of $138 million. UTE was concerned with the blackouts and the projected higher demands for electricity by 1995. One option was to build a coal- or oil-fired powerplant, in Punta Pedregal on the outskirts of Montevideo, at an estimated cost of $200 million. This project is a feasible cogenerating electrical facility and a backup system to the hydrogenerating grid.

The World Bank provided a $24 million loan to Administración Nacional de Conbustibles, Alcohol y Portland (ANCAP) to modernize its oil refinery and improve capacity to refine various grades of crude oil and reduce operational costs. Total project cost was estimated at $30 million; $6 million was to be supplied by the Government. Project engineering was underway; equipment was to be purchased in 1989. The project was expected to be completed by late 1990.

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[1] Prepared by Orlando Martino, supervisory physical scientist, Chief, Branch of Latin America and Canada.

[2] Prepared by Pablo Velasco, physical scientist, Division of International Minerals.

[3] Where necessary, values have been converted from Argentine australes to U.S. dollars at the rate of australes5.8 = US$1.00, the average exchange rate in 1988.

[4] Prepared by Pablo Velasco, physical scientist, Division of International Minerals.

[5] Where necessary, values have been converted from Chilean pesos (Ch$) to U.S. dollars at the rate of Ch$245 = US$1.00, the average exchange rate for 1988.

[6] By Alfredo C. Gurmendi, physical scientist, Division of International Minerals.

[7] Where necessary, values have been converted from Paraguayan guaranies (Gs) to U.S. dollars at the average market rate of Gs910 = US$1.00 for 1988.

[8] By Alfredo C. Gurmendi, physical scientist, Division of International Minerals.

[9] Where necessary, values have been converted from Uruguayan new pesos (N$) to U.S. dollars at the rate of N$358 = US$1.00.

TABLE 7

URUGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1984	1985	1986	1987[p]	1988[e]
Aluminum, secondary		31	20	51	56	[3]65
Barite		10	15	15	[e]15	15
Cement, hydraulic	thousand metric tons	334	314	340	401	[3]434
Clays, unspecified		70,936	150,000	[e]150,000	[e]150,000	150,000
Coke, gashouse[e]		10,000	8,000	8,000	8,000	8,000
Corundum[e]		50	40	40	40	40
Feldspar[e]		[3]1,950	1,000	1,000	1,000	1,000
Gem stones, semiprecious:						
Agate		108	90	[e]90	[e]90	90
Amethyst		21	20	[e]20	[e]20	20
Gypsum[e]		[3]74,091	100,000	100,000	100,000	100,000
Iron and steel:						
Ferroalloys: Electric-furnace ferrosilicon crust		162	250	[e]250	[e]250	250
Steel, crude		40,763	38,964	30,987	30,200	[3]28,700
Semimanufactures		35,789	31,773	34,348	43,500	[3]18,000
Lime	thousand metric tons	8	9	10	13	10
Petroleum refinery products:						
Gasoline	thousand 42-gallon barrels	1,643	1,649	1,660	1,540	1,550
Jet fuel	do.	152	184	182	264	300
Kerosene	do.	572	452	415	457	500
Distillate fuel oil	do.	3,348	2,992	2,324	3,290	3,300
Residual fuel oil	do.	2,725	2,301	2,434	2,418	2,500
Lubricants	do.	46	[r]49	[r]49	56	60
Liquefied petroleum gas	do.	482	498	459	580	600
Unspecified	do.	251	189	225	826	800
Refinery fuel and losses	do.	-151	-386	22	[e]20	20
Total	**do.**	**9,068**	**[r]7,928**	**[r]7,770**	**9,451**	**9,630**
Sand and gravel:						
Sand, common	thousand metric tons	1,391	1,500	[e]1,500	[e]1,500	1,500
Gravel	do.	237	500	[e]500	[e]500	500
Stone:						
Dimension	do.	10	8	[e]8	[e]10	10
Crushed and broken:						
Alum schist		9,977	8,000	[e]8,000	[e]8,000	8,000
Dolomite	thousand metric tons	4	3	[e]3	[e]3	3
Limestone	do.	666	700	[e]700	[e]700	700
Marble	do.	4	4	[e]4	[e]5	5
Marl		4,257	7,000	[e]7,000	[e]7,000	7,000
Quartz		150	300	[e]300	[e]300	300
Other, including ballast	thousand metric tons	1,969	1,900	[e]1,900	[e]2,000	2,000

See footnotes at end of table.

TABLE 7—Continued

URUGUAY: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]	1984	1985	1986	1987[p]	1988[e]
Sulfur, elemental, byproduct[e]	2,000	2,000	2,000	2,000	2,000
Talc, soapstone, pyrophyllite	1,658	1,500	[e]1,500	[e]1,500	1,500
Tuff, Tufa	4,347	3,500	[e]3,500	[e]3,500	3,500

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Includes data available through mid-June 1989.

[2]In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) undoubtedly were also produced, but output was not reported, and available information was inadequate to make reliable estimates of output levels.

[3]Reported figure.

TABLE 8

URUGUAY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Destinations, 1987	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	9	6	—	All to Paraguay.
Metal including alloys, semimanufactures	199	275	—	Argentina 130; Paraguay 40; Peru 25.
Copper: Metal including alloys, semimanu factures	28	6	—	All to West Germany.
Iron and steel: Metal:				
Steel, primary forms	323	—		
Semimanufactures:				
Bars, rods, angles, shapes, sections	9,087	4,103	—	All to Argentina.
Universals, plates, sheets	705	1,136	917	Bolivia 150; Argentina 67.
Hoop and strip	133	354	—	All to Argentina.
Wire	2,549	3,565	—	Argentina 2,746; Brazil 771; Bolivia 30.
Tubes, pipes, fittings	575	1,063	—	Argentina 603; Brazil 416; Chile 44.
Castings and forgings, rough: value, thousands	—	$5	—	All to Argentina.
Lead: Metal including alloys, unwrought	60	164	—	Do.
Zinc: Oxides	223	747	—	Brazil 730; Argentina 17.
Other: Ashes and residues	—	650	—	All to Brazil.
INDUSTRIAL MINERALS				
Cement	3,060	6,960	—	Brazil 6,940; Argentina 20.
Clays, crude	—	2	—	All to Argentina.
Fertilizer materials: Manufactured:				
Nitrogenous	—	240	—	All to Paraguay.
Phosphatic	27,366	48,694	—	Brazil 45,193; Argentina 3,501.
Potassic	60	—		
Unspecified and mixed	3,950	37,609	—	Brazil 34,034; Paraguay 3,408.

See footnote at end of table.

TABLE 8—Continued

URUGUAY: EXPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	Destinations, 1987	
				United States	Other (principal)
INDUSTRIAL MINERALS—Continued					
Lime		105	—		
Precious and semiprecious stones other than diamond, natural	value, thousands	$348	$768	$367	West Germany $267; France $35.
Sodium compounds, n.e.s.:					
Carbonate, manufactured		30	153	NA	NA.
Sulfate, manufactured		4,495	5,421	—	Argentina 1,401; Brazil 1,080; Peru 918.
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	value, thousands	$920	$1,268	—	Japan $695; Italy $479; Argentina $87.
Worked		535	10	—	All to Spain.
Gravel and crushed rock		34,640	33,550	—	All to Argentina.
Sand other than metal-bearing		195,288	206,897	—	Do.
Sulfur:					
Elemental: Crude including native and byproduct		388	202	—	All to Paraguay.
Sulfuric acid		13,505	5,922	—	Brazil 3,400; Argentina 2,390; Paraguay 132.
Talc, steatite, soapstone, pyrophyllite		50	104	—	All to Argentina.
Other: Slag and dross, not metal-bearing		20	150	—	Do.
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Gasoline, motor	42-gallon barrels	85,179	—		
Distillate fuel oil	do.	—	68,341	—	All to Argentina.
Lubricants	do.	273	1,309	—	Argentina 455; Brazil 105; Peru 49.
Bituminous mixtures	do.	230	242	—	All to Brazil.

NA Not available.
[1] Table prepared by H. G. Wills.

TABLE 9

URUGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	3,951	8,455	—	All from Brazil.
Oxides and hydroxides	1,203	1,102	2	Brazil 564; West Germany 495; United Kingdom 30.
Metal including alloys:				
Unwrought	1,991	2,693	—	Argentina 2,628; Brazil 60; United Kingdom 5.
Semimanufactures	371	958	(2)	Argentina 803; Brazil 63; France 56.
Chromium:				
Ore and concentrate	4	4	—	All from Brazil.
Oxides and hydroxides	1,013	15	—	West Germany 8; Argentina 4; Brazil 3.
Cobalt: Oxides and hydroxides value, thousands	$2	$5	—	West Germany $3; Republic of Korea $1.
Copper: Metal including alloys:				
Unwrought	10	54	—	Peru 30; Chile 22; Argentina 2.
Semimanufactures	1,733	2,514	8	Chile 1,630; Brazil 432; Peru 249.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	570	594	9	Paraguay 300; Brazil 245; Argentina 36.
Ferroalloys:				
Ferromanganese	299	194	—	Brazil 192; West Germany 2.
Unspecified	518	450	—	Brazil 427; West Germany 13; Republic of South Africa 5.
Steel, primary forms	12,520	19,507	—	Argentina 15,365; Venezuela 2,992; Brazil 1,150.
Semimanufactures:				
Bars, rods, angles, shapes, sections	11,285	18,313	(2)	Argentina 9,194; Brazil 6,807; Poland 970.
Universals, plates, sheets	15,707	56,932	221	Brazil 26,960; Argentina 24,162; Republic of South Africa 2,205.
Hoop and strip	924	1,431	68	Brazil 763; West Germany 351; Australia 117.
Rails and accessories	98	12	—	All from Japan.
Wire	1,441	1,366	1	Argentina 631; Brazil 572; Republic of South Africa 79.
Tubes, pipes, fittings	269	2,127	2	Brazil 1,343; Argentina 324; Venezuela 170.
Castings and forgings, rough	—	6	—	Argentina 5; Peru 1.
Lead:				
Oxides	3,107	145	—	Argentina 89; Mexico 56.
Metal including alloys, unwrought	1,312	1,927	—	Mexico 1,526; Argentina 400; Brazil 1.
Magnesium: Metal including alloys:				
Unwrought	1	12	12	
Semimanufactures	9	11	4	Italy 5; Canada 2.
Manganese: Oxides	12	22	—	West Germany 15; Brazil 7.

See footnotes at end of table.

TABLE 9—Continued

URUGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		1986	1987	Sources, 1987	
				United States	Other (principal)
METALS—Continued					
Mercury	76-pound flasks	145	986	(2)	Mexico 957; West Germany 29.
Molybdenum: Metal including alloys, all forms	value, thousands	$8	$15	—	Austria $9; Netherlands $5.
Nickel: Metal including alloys:					
Unwrought		8	15	—	Canada 13; Norway 2.
Semimanufactures		15	37	(2)	West Germany 32; Canada 3; France 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:					
Platinum	value, thousands	—	$10	—	All from West Germany.
Silver: Metal including alloys, unwrought and partly wrought	do.	$1	$6	—	All from Chile.
Tin: Metal including alloys:					
Scrap		1	—		
Unwrought		29	25	—	All from Brazil.
Semimanufactures		2	2	—	Mainly from Brazil.
Titanium: Oxides		30	120	(2)	United Kingdom 116; Italy 4.
Tungsten: Metal including alloys, all forms	value, thousands	$6	$10	$1	Japan $4; United Kingdom $4.
Zinc:					
Oxides		121	40	1	Argentina 32; France 7.
Metal including alloys:					
Unwrought		1,497	1,950	—	Mexico 1,883; Austria 20; Peru 20.
Semimanufactures		41	70	2	West Germany 29; Belgium-Luxembourg 17; Netherlands 11.
Other:					
Ores and concentrates		10	24	19	Netherlands 5.
Oxides and hydroxides		11	6	3	West Germany 3.
Ashes and residues		—	960	—	Mexico 776; Chile 154; Cuba 30.
Base metals including alloys, all forms		4	10	—	Netherlands 6; U.S.S.R. 3.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural: Corundum, emery, pumice, etc.		111	548	11	Argentina 518; Netherlands 10.
Artificial: Corundum		85	110	(2)	Brazil 109; Argentina 1.
Grinding and polishing wheels and stones	value, thousands	$306	$479	$26	Brazil $127; West Germany $61; Italy $45.
Asbestos, crude		1,003	1,193	—	Brazil 910; Republic of South Africa 140.
Barite and witherite		22	65	1	Argentina 64.
Boron materials:					
Crude natural borates		306	—		
Oxides and acids		227	250	5	Argentina 242; Brazil 2.
Cement		646	49	—	France 42; Brazil 4.

See footnotes at end of table.

TABLE 9—Continued

URUGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Chalk	12	31	12	France 19.
Clays, crude	4,686	7,207	907	Brazil 3,787; Argentina 2,513.
Diamond: Industrial stones value, thousands	—	$1	—	All from Argentina.
Diatomite and other infusorial earth	62	74	—	Argentina 40; Brazil 34.
Feldspar, fluorspar, related materials	31	93	—	Argentina 83; United Kingdom 10.
Fertilizer materials: Manufactured:				
Ammonia	543	671	—	Argentina 549; Brazil 116; Netherlands 3.
Nitrogenous	53,219	36,478	—	East Germany 17,747; Mexico 7,644; Brazil 6,426.
Phosphatic	20,835	31,800	13,850	Brazil 12,250; Morocco 5,700.
Potassic	6,536	5,310	—	West Germany 4,009; Brazil 1,300; Switzerland 1.
Unspecified and mixed	42,648	40,034	33,902	Morocco 2,400; Brazil 2,047; Belgium-Luxembourg 1,506.
Graphite, natural	29	49	—	Brazil 36; West Germany 9; Argentina 3.
Gypsum and plaster	960	1,247	—	Argentina 797; West Germany 450.
Magnesium compounds: Magnesite, crude	46	62	1	Brazil 36; Netherlands 11; West Germany 9.
Mica:				
Crude including splittings and waste	39	69	14	Brazil 50; Norway 5.
Worked including agglomerated splittings	2	2	—	All from Spain.
Nitrates, crude	312	266	—	All from Chile.
Phosphates, crude	35,422	89,700	—	Tunisia 44,000; Togo 25,000; Senegal 20,700.
Pigments, mineral: Iron oxides and hydroxides, processed	171	244	4	Argentina 125; West Germany 97; Spain 9.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$12	$6	$6	
Synthetic do.	$16	$14	$10	Switzerland $4.
Pyrite, unroasted	2	—		
Salt and brine	76,801	63,841	17	Chile 61,940; Argentina 1,732; West Germany 147.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	11,648	14,773	—	Spain 12,863; Poland 1,117; France 747.
Sulfate, manufactured	2,196	1,970	7	Mexico 1,080; Chile 535; West Germany 123.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	21,264	948	—	Brazil 589; Argentina 359.
Worked	14	28	—	Brazil 22; Argentina 6.
Dolomite, chiefly refractory-grade	105	227	—	Brazil 182; Argentina 45.

See footnotes at end of table.

TABLE 9—Continued

URUGUAY: IMPORTS OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity	1986	1987	Sources, 1987	
			United States	Other (principal)
INDUSTRIAL MINERALS—Continued				
Stone, sand and gravel—Continued				
Quartz and quartzite	—	62	—	All from Argentina.
Sand other than metal-bearing	20	6	1	Belgium-Luxembourg 5.
Sulfur:				
Elemental:				
Crude including native and byproduct	24,684	15,350	15,350	
Colloidal, precipitated, sublimed	8	8	3	West Germany 2; United Kingdom 2.
Sulfuric acid value, thousands	$2	$2	—	All from West Germany.
Talc, steatite, soapstone, pyrophyllite	63	21	4	Brazil 13; West Germany 4.
Other: Crude	194	598	—	United Kingdom 305; Mexico 110; Netherlands.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1	1	1	
Carbon black	2,363	2,808	17	Argentina 2,054; Mexico 606; Brazil 93.
Coal:				
Briquets of anthracite and bituminous coal	4	8	—	All from Argentina.
All grades excluding briquets	500	502	—	Poland 500; Austria 2.
Coke and semicoke	2	11	—	All from Argentina.
Peat including briquets and litter	18	—		
Petroleum:				
Crude thousand 42-gallon barrels	9,917	8,251	—	Mexico 3,386; Nigeria 2,810; United Arab Emirates 1,037.
Refinery products:				
Liquefied petroleum gas[3] do.	25	90	—	All from Brazil.
Gasoline, motor do.	162	92	(2)	Brazil 61; Netherlands 16; Argentina 15.
Mineral jelly and wax do.	6	4	(2)	Argentina 3; Brazil 1.
Kerosene and jet fuel do.	26	155	—	Mainly from Argentina.
Distillate fuel oil do.	476	318	—	Saudi Arabia 212; Brazil 106.
Lubricants do.	153	119	13	Argentina 75; Chile 8.
Residual fuel oil do.	217	—		
Bituminous mixtures do.	(2)	2	—	Mainly from West Germany.
Petroleum coke do.	18	22	—	Mainly from Argentina.

[1] Table prepared by H. D. Willis.
[2] Less than 1/2 unit.
[3] May include natural gas.

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